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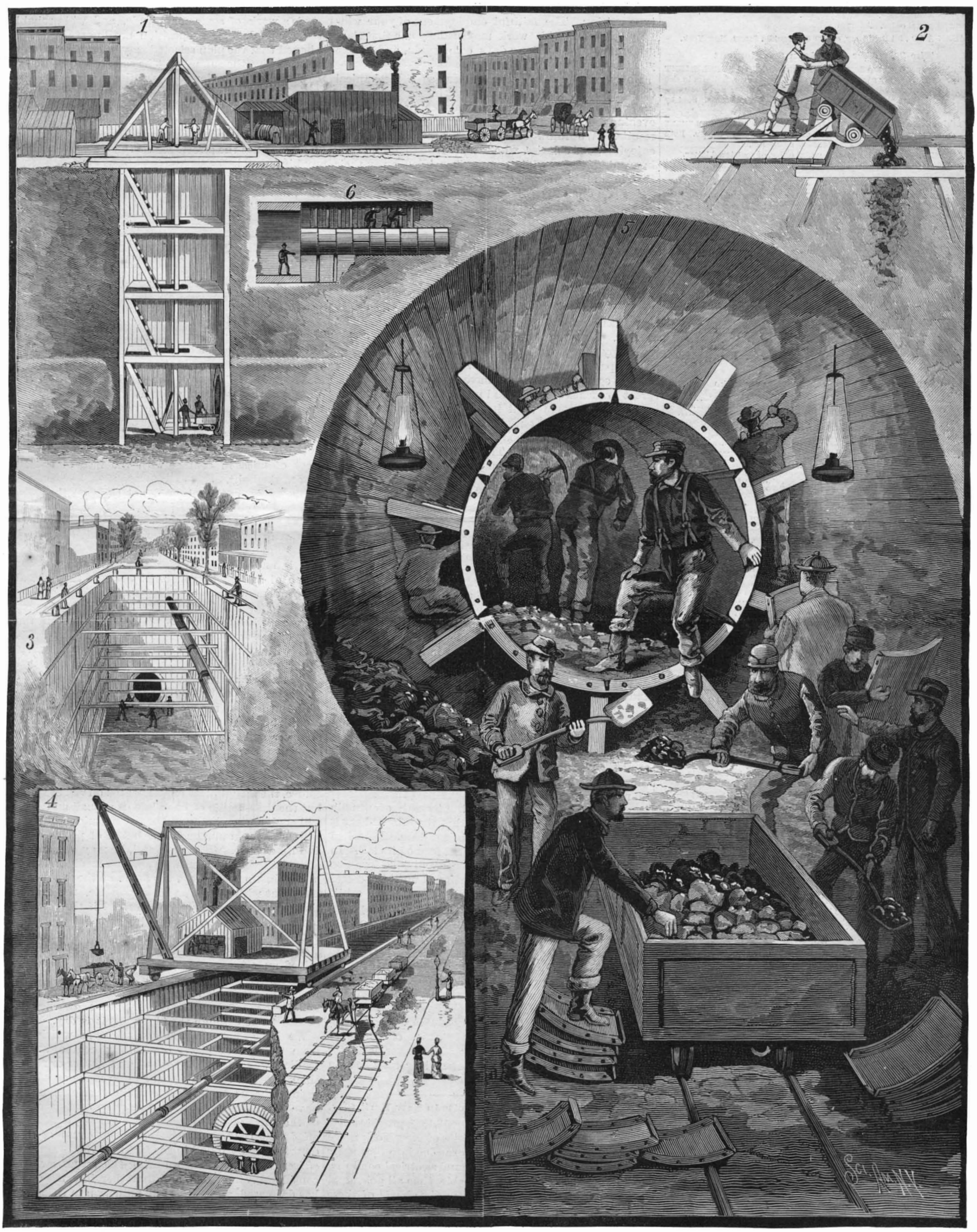

A GREAT SEWER BUILT BY AN IMPROVED METHOD OF TUNNELING, IN BROOKLYN, N. Y.—[See page 373.]

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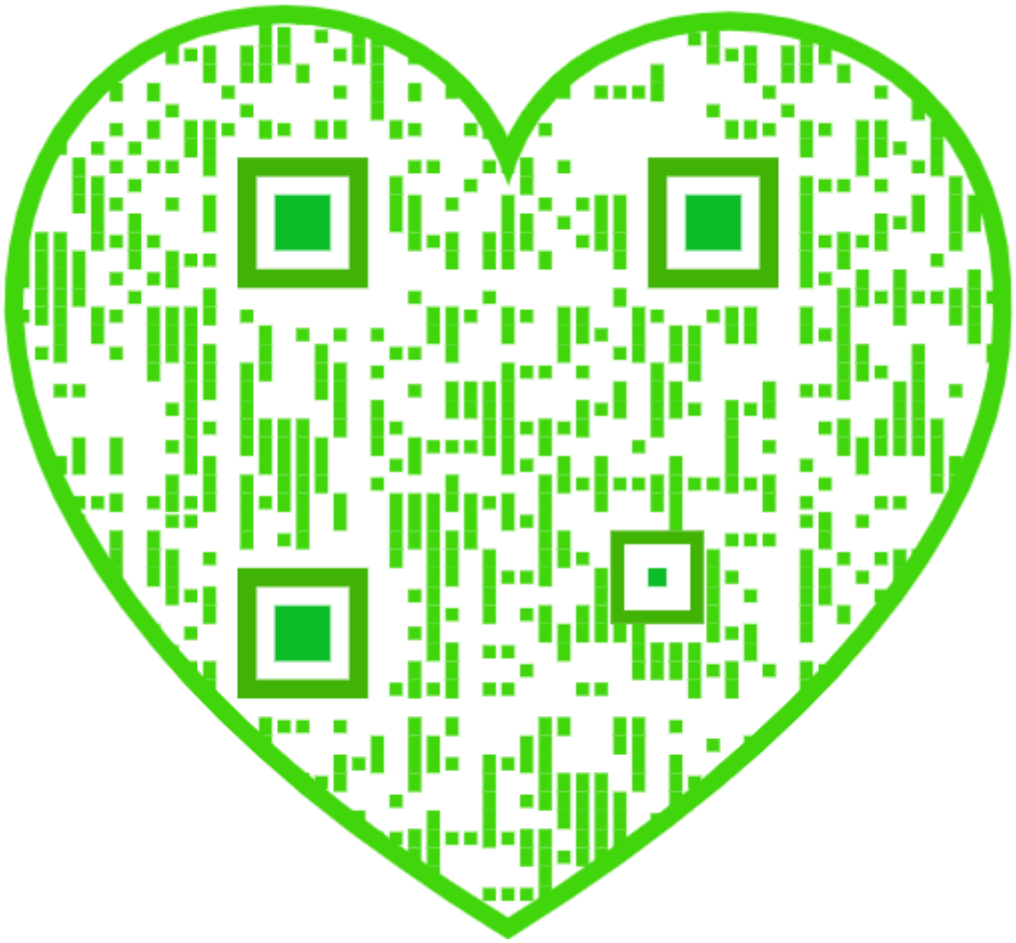

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NEW YORK, SATURDAY, DECEMBER 12, 1885.

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HOW TO MAKE WINTER EVENINGS PROFITABLE.

This is the season of short days and long evenings, the best time of all the year for study and improvement.

Perhaps you are a young man desirous of obtaining commercial employment. One of the best passports in that direction, next to good character, is good handwriting. Of course, you know how to write, but like the great majority, probably, you have never trained yourself to write well. No merchant wants his books disfigured by awkward and illegible scrawling. No lawyer will submit to badly written copies. We suggest you devote yourself this winter to persevering endeavors to improve your penmanship. You will be surprised at the improvement which real effort in this line will achieve.

May be you would like to learn stenography and type writing. The faithful employment of your winter evenings in this work may make you a first-class graduate before the long days come again, and enable you to earn a handsome support.

Do you wish to become expert as a mechanical draughtsman? There are excellent instruction books, sold very cheaply. The industrious occupation of your evening hours as a learner will surely be fruitful of results. We know of excellent draughtsmen, now enjoying good salaries, who taught themselves to draw in evening hours, while companions idled away their time in smoking, cards, or gossip.

Are you of an inventive turn of mind? The best of all times to study up and think out plans for new contrivances is in the quietude of evening. The results of earnest thought in the production of inventions are simply astonishing. In general, it is the improvements in simple devices, things of everyday use and that everybody wants, which are the most profitable. The patent for the little invention of the spring window shade roller, now so generally employed in all dwellings, has brought great wealth to the fortunate inventor. He is now a millionaire. His device was truly a happy thought. We know of a lady in Chicago whose patents for the invention of a moving belt for drying eggs, albumen, etc., have revolutionized certain great branches of trade, and now bring her a great income. The people want improvements in every conceivable form. Not only is the field of invention vast, but it is open to everybody. There are no distinctions in respect to sex or age. The way to invent is to "keep thinking;" the way to accomplish anything is to "keep working."

THE NOVEMBER METEORIC SHOWERS.

The meteoric display of Nov. 27th was visible to the inhabitants of more than a quarter of the globe. It was observed at Teheran, Persia, and was unusually brilliant in other parts of Asia, as well as in Naples and London. What was seen in our own locality during the evening was only the end of the main shower. At the Yale observatory, shortly after six o'clock, forty-four shooting stars were counted in twenty-four minutes. Many of them had considerable brilliancy, and left trails of light behind them. Later in the evening, the meteors were less numerous, but were estimated at 100 per minute. They appeared to radiate from Andromeda, and as one observer can see but about one-sixth of those visible, something near six hundred meteors could probably have been counted in a minute had the staff of observers been sufficient.

The display is due to the breaking up of Biela's comet, a dissolution first noticed in 1846. Since then the work has progressed rapidly, until the comet is now in millions of fragments. In ages past the wanderer traveled among the fixed stars, but its path eventually approached so near to the sun that the intense heat is supposed to have started the disintegration. Detached fragments trailing after the comet formed its tail. In 1840 it was observed to have become divided into two parts. This destruction has continued until the comet is but a mass of fragments, which follow the old orbit. Once in about six and two-third years the earth passes through this meteoric belt. The fragments of the comet are made luminous by their rapid movement through the atmosphere, and not unfrequently fall to the earth. The display lasts as a rule for two or three hours, but varies greatly in its brilliancy. The last one of any importance was in 1872, when between fifty and one hundred thousand stars could have been observed by a single party. The display of 1879 was less striking. The next contact with the ruins of the comet occurs in 1892. Though the main shower lasts for but a short time, an occasional meteor may be seen almost up to Christmas-time.

Underground Electrical Conduits in New York City.

The New York State law of June 13, 1885, provides that the authorities of the larger cities of New York State shall appoint commissioners to examine into the merits of different systems of underground electrical conduits, and to see that within a reasonable time all poles and overhead wires are removed from the streets of these cities. In New York city, Messrs. Charles E. Loew, Theodore Moss, and Jacob Hess were appointed commissioners. In compliance with the further terms of the law, they immediately served notice upon the companies then in existence to present plans for the transfer of their lines to underground conduits, giving them sixty days in which to respond. As the companies failed to present a satisfactory scheme, the commissioners are investigating the subject themselves, and apparently mean to do it thoroughly. They have invited those interested to submit plans, and there are already over a hundred schemes represented at the rooms of the Commission, 23 West 23d St. These form a veritable museum of electrical contrivances, and are now being catalogued. The commissioners expect to visit Chicago, Washington, Philadelphia, and other cities where underground systems are in operation. With the help of experts, they will then begin the difficult task of sifting out the best and most feasible scheme.

It is a work of some magnitude, and will probably result in no definite proposition until next spring. It is hoped that the plan selected may be carried into operation during the summer. The companies themselves are stated to be anxious to have the underground plan carried out, as a matter of economy in the long run, and are doing what they can to aid the work of the Commission. When a plan is finally selected, the commissioners have full authority to compel its adoption by all who use the streets for carrying electric wires of any kind.

We judge that the Secretary of the Commission, Mr. Moss, has an embarrassment of riches in the plans already submitted to him; but as the search is for the *best*, the competition is still open.

PHOTOGRAPHIC NOTES.

To Prevent the Cracking of Lantern Condensers.—When the oxyhydrogen light is used in the optical lantern, accidents often happen by the cracking of the condenser from unequal heating, by reason of its close proximity to the light. One method which has been proposed consists in clamping a small sheet of glass directly against the face of the condenser, and in also providing, by perforations in the surrounding metal band, for the free circulation of the air between the lenses. Should the heat become too intense, the glass plate will crack and thereby save the condenser.

At one of the recent meetings of the Amateur Photographic Society in this city, Dr. Laudy stated that he had used for some time, with perfect safety, a thin sheet of mica in contact with the face of the lens toward the light.

The streaks in the mica did not show on the screen, and but very slightly retarded the light. It was advised that a very clear sheet be selected, as a yellow specimen would interfere too much with the transmitted light.

It is undoubtedly a wise precaution to use some screen of a refractory material between the light and the condenser.

Testing the Thickness of Gelatine Films.—Concerning the manufacture of dry plates and the recent tendency of the manufacturers to increase their sensitiveness without regard to other desirable qualities, such as opaqueness to resist halation, the *Photographic News* remarks:

A good way of testing if the thickness of a film is sufficient to give the required opacity is the following: The film is wetted, and the plate is placed between the observer and a bright gas or lamp flame. If the film is thick enough, the shape of the flame will not be seen through any part of it; in other words, it (the film) will be translucent, but not transparent. Of course, the actual plate experimented on will be spoiled, but the destruction of one plate is a small matter if it will enable the photographer to determine whether he will be wise in purchasing a batch of plates or not; and if he desires to try several, he may use any safe artificial light in which no diffusing medium is used, in which, that is to say, the flame of the light is visible. But with the safest light possible, the examination must be very rapidly performed if the plates are sensitive. They must be held near the light, and at the best the test is not so searching as with an uncovered light. Of course, the plates used may have received an exposure, and the test may be performed immediately before development, so that there is no waste. Plates which show a flame as described should be rejected, much more those which show the shape of the flame through the film while it is dry.

We have so far pointed out the evils which result from the use of plates too thinly coated, and the readiest way of judging of a film whether or not it is thick enough; and now we have to make a somewhat serious charge against plate makers in general. We have no hesitation in saying that the *average* opacity of the films of plates in the market has greatly fallen off during the last few years. One cause of this is doubtless to be found in the fact that the average *sensitiveness* of plates has, during the same few years, considerably increased, and that, therefore, the opacity has decreased, apart from any reduction in the amount of silver used. Every one who has experimented with emulsion knows that, as a rule, increase of sensitiveness means decrease of opacity and covering power.

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ASPECTS OF THE PLANETS FOR DECEMBER.

SATURN

is morning star until the 26th, when he becomes evening star. On the 26th, at 6 o'clock in the morning, he is in opposition with the sun, his place in the heavens being then, as the word implies, opposite the sun. He rises in the east at that time as the sun sinks in the west, and adorns the sky from sunset to sunrise. He presents a grand display throughout the month, and thirty years must complete their slow circuit before he will again be visible in his present aspect.

The hour has come that observers have so long desired. The beautiful planet is in opposition, only two months past perihelion, his magnificent rings are open to their widest extent, and he has reached his highest northern declination. He is charming to behold as he makes his way with retrograde steps through the smaller stars of Gemini. He is surpassingly lovely in the telescope as he lies cradled in his rings, and surrounded by the points of gold that reveal the presence of his eight satellites.

These are red-letter days for Saturnian astronomers, who will not fail to improve the precious opportunity for studying his complex system, especially the constitution of the dark spaces between his rings, and the shadowy markings on his disk. The features of this planet's surface are of extreme delicacy. The eye must be practiced, the instrument of the best kind, and the atmosphere clear to give any hope of reaching reliable results. Mr. Denning, of Bristol, a close observer, gives an interesting report in *Nature* of observations that have been made upon the Saturnian belts during the last few oppositions.

A very definite narrow dark belt has bounded the southern side of the equator, remarkable for its compact appearance, though exhibiting no distinct spots. One or two observers have detected proofs of condensation. The belts near the pole are so faint that there is doubt if they have really been seen except by the eye of fancy. It is generally agreed that some of the features of the planet are variable, and this accounts for the difference of opinion among observers. Especially is this the case in regard to the division between the rings and the division in the outer ring. These must fluctuate at short intervals, or the evidence of different observers and different telescopes is strangely at variance. There is not much probability that definite results will be reached at the present opposition, even under such favorable conditions. None the less should the observation be thorough, close, and long-continued, for this is the only method by which terrestrial observers can hold communion with the other planets, or learn even the first lessons of what is going on in their distant domains. It is easy to recognize Saturn as he rises in the northeast about 6 o'clock in the evening on the 1st of the month, for he is almost in line between Pollux and Betelguese.

The right ascension of Saturn on the 1st is 6 h. 29 m.; his declination is 22° 23′ north; his diameter is 19·2″; and he is in the constellation Taurus.

Saturn rises on the 1st about 6 o'clock in the evening; on the 31st he sets a quarter before 7 o'clock in the morning.

VENUS

is evening star. She reaches one of the great time-marks in her course during the month. On the 8th, at 9 o'clock in the evening, she is at her greatest eastern elongation, being 47° 19′ east of the sun. Her progress eastward is then stayed. Remaining stationary for a few days, she commences to turn her steps westward, increasing her pace, apparently approaching the sun, and really approaching the earth.

There is no need to call attention to her lovely aspect as night after night she holds her court in the western sky as queen of the stars, now shining amid the golden glow of the sunset and now rejoicing amid the crimson hues that make the western sky like a dream of beauty. One never tires of admiring this bewitching star. She will be charming as she retraces her steps toward the sun, and afford a fine subject for study in the remaining two months of her course as evening star.

Seen through a telescope at elongation, she takes on the phase of the moon at her last quarter. She will quickly assume that of the waning crescent as she approaches us more nearly, increasing in size through turning less and less of her illumined disk to the earth until only a thread of light is visible as she passes between us and the sun at inferior conjunction.

The right ascension of Venus on the 1st is 19 h. 58 m.; her declination is 23° 25′ south; her diameter is 23·6″; and she is in the constellation Sagittarius.

Venus sets on the 1st at half past 7 o'clock in the evening; on the 31st she sets at 8 o'clock.

JUPITER

is morning star. On the 26th, at 5 o'clock in the morning, he is in quadrature with the sun, being 90° west of him. His southern declination will prevent his being seen under the best aspect, but he is now in fine position for observation, notwithstanding this drawback. At the time of the latest observations before the conjunction of Jupiter, the famous red spot, which had nearly disappeared, showed unmistakable evidences of activity. The ellipse grew darker, the central light cloud disappeared, and the spot had reassumed the appearance it presented in 1878. Interest for Jovian observers will therefore center in the present aspect of the red spot and the changes that have taken place during the time the planet was hidden in the sun's rays. The Prince of Planets is more tangible than his more distant brother Saturn, and his atmospheric features are more firmly established. Observers will therefore find interesting subjects for study in the red spot, the dark belts, the white spots bordering them, while the huge planet is favorably situated, as he is, during the entire month, rising before midnight at its close.

On the 8th, at 6 o'clock in the evening, Jupiter is in close conjunction with Eta Virginis, a star of the third magnitude in Virgo, being 10′ south. Planet and star are invisible at the time of conjunction, but will be near each other on the morning of the 9th.

The right ascension of Jupiter on the 1st is 12 h. 12 m.; his declination is 0° 6′ north; his diameter is 32·8″; and he is in the constellation Virgo.

Jupiter rises on the 1st a few minutes after 10 o'clock in the morning; on the 31st he rises a few minutes before half past 11 o'clock in the evening.

MARS

is morning star. On the 3d, at 6 o'clock in the evening, he is in quadrature with the sun, and henceforth until he reaches opposition will be of some importance on the planetary record. Mars is the only one of all the planets of the system where we probably see the real surface and distinct markings that indicate land and water. We simply see atmospheric effects in the other planets. The last opposition of Mars brought the planet to view in a most unfavorable light, on account of his great distance at the time. Schiaparelli, however, managed to detect the double markings in the so-called "canals." The next opposition is nearly as unfavorable as the last, but there is alway a possibility that something valuable may be added to what is known, or at least that former observations may be verified. On the 3d of December, Mars is in conjunction with Regulus, being 1° 19′ north. For several days the star and the planet may be seen in the same field of vision in a marine glass. Mars will be easily found during the month, on account of his vicinity to Regulus.

The right ascension of Mars on the 1st is 10 h. 43m.; his declination is 9° 21′ north; his diameter is 7·6″; and he is in the constellation Leo.

Mars rises on the 1st about a quarter after 11 o'clock in the evening; on the 31st he rises a quarter after 10 o'clock.

URANUS

is morning star. He reaches quadrature on the 28th, at 10 o'clock in the evening, making the third planet in quadrature on the sun's western side during the month, the events occurring in the following order: Mars, Jupiter, Uranus.

The right ascension of Uranus on the 1st is 12 h. 26 m.; his declination is 2° 7′ south; his diameter is 3·6″; and he is in the constellation Virgo.

Uranus rises on the 1st at half past 1 o'clock in the morning; on the 31st he rises soon after half past 11 o'clock in the evening.

MERCURY

is evening star until the 18th, and then joins the morning stars. On the 18th, at 11 o'clock in the evening, he is in inferior conjunction with the sun, passing between the earth and the sun, and reappearing on his western side as morning star.

The right ascension of Mercury on the 1st is 18 h. 4 m.; his declination is 25° 37′ south; his diameter is 6·6″; and he is in the constellation Sagittarius.

Mercury sets on the 1st at half past 5 o'clock in the evening; on the 31st he sets about half past 5 o'clock in the morning.

NEPTUNE

is evening star.

The right ascension of Neptune on the 1st is 3 h. 15 m.; his declination is 16° north; his diameter is 2·6″; and he is in the constellation Taurus.

Neptune sets on the 1st about half past 5 o'clock in the morning; on the 30th he sets about half past 3 o'clock.

THE MOON.

The December moon fulls on the 21st at 3 h. 58 m. P.M. On the 8th, the two days' old moon is in conjunction with Mercury at 1 h. 9 m. A.M., being 6° 3′ north. On the 10th he is in conjunction with Venus at 6 h. 19 m. P.M., being 5° 56′ north. On the 19th she is near Neptune at 2 h. 24 m. A.M., being 2° 45′ south. On the 22d she is at her nearest point to Saturn, 6 m. after midnight, being 3° 58′ south. On the 27th, she is in conjunction with Mars at 4 h. 19 m., A.M. being 2° 48′ south. On the 28th, she is in conjunction with Uranus at 7 h. 41 m. A.M., being 55′ north.

OCCULTATIONS.

The moon occults the planets Jupiter and Uranus, and the bright star Aldebaran, as well as numerous stars of less note on the celestial calendar during the month. The occultation of Jupiter is by far the most interesting. The phenomenon as seen from the center of the earth will take place on the 28th, at 3 h. 55 m. A.M., Washington mean time. It will be visible to all observers on the earth's surface whose position corresponds to the position of the moon as seen from the earth's center, or her geocentric position. They must, however, be on the dark side of the earth at the time, and between the limiting parallels of 39° north and 29° south. The occultation will be visible for a very short time at Washington, the latitude being 38° 53′ north, just below the northern limiting parallel. There will be a close conjunction of the moon and Jupiter in this vicinity that will be worth getting up early to observe, the moon being within a few hours of her last quarter and the bright planet being fair to see, for moon and star will hang side by side before the breaking of the dawn.

The occultation of Uranus occurs on the same morning at 7 h. 41 m., A.M. Washington mean time, and is of course invisible in this vicinity, as it takes place after sunrise.

The occultation of Aldebaran, for the twelfth time during the year, will occur on the 20th, at 4 h. 28 m. A.M., Washington mean time. The phenomenon will be visible at Washington. The immersion of the star occurs at 5 h. 15 m. A.M., Washington mean time. The occultation continues 49 m. The emersion occurs at 6 h. 7 m. A.M., but will not be visible, as moon and star are then below the horizon.

DECEMBER

shows an active condition of the sun's family. The heavens are alive with interesting events among our celestial neighbors, the planets. The moon occults Jupiter and Uranus on the same morning, and hides from view the red star Aldebaran on another occasion. A telescopic view of the occultation of Jupiter presents a scene of wondrous beauty. The Prince of Planets surrounded by his beaming satellites plunges headlong into the moon's domain, and is suddenly blotted from the sky. It is only for a short time. He soon reappears as majestic and stately as ever, pursuing his course among the stars, and soon with his companions to disappear in the coming daylight. The opposition of Saturn is a noteworthy event on the monthly record. There are also to add to the list the quadratures of Mars, Jupiter, and Uranus, the greatest eastern elongation of Venus, and the inferior conjunction of the swift-footed Mercury. Mars holds a conference with Regulus, and Jupiter draws near to Eta Virginis.

December, therefore, presents a prospect of enjoyment and abundant opportunity for steady work for those who follow the planets in their courses, and seek to fathom the mysterious bond that unites planet to planet, and binds the members of the solar family into one harmonious whole. They bear constant and tangible testimony to the resistless sway wielded by the all-powerful sun, whose least disturbance is felt in the system's remotest bounds, and who holds within his fiery orb the issues of life and death for his family of worlds. In his life we live, in his death we die.

The sun crowns the month with two great events. On the 21st, he reaches the winter solstice, when he turns his smiling face northward, and gives promise of the more gentle breezes and warmer sunbeams that will surely follow his approaching steps. On the 30th the sun is in perigee, or at his nearest point to the earth, being 3,000,000 miles nearer than when most distant, thus tempering the severity of winter in our northern clime.

Trial of the Dynamite Air Gun.

Three dynamite projectiles were thrown from Lieut. Zalinski's pneumatic gun, at Fort Lafayette, New York harbor, on the afternoon of Nov. 28. The projectiles were thrown a distance of about two miles, and two of them, one containing 50 and the other 100 lb. of nitroglycerine, exploded in a most satisfactory manner, the other one sinking in the water without exploding. Previous to firing the dynamite-loaded projectiles, experiments were made with those loaded with sand, to obtain the proper range, and Lieut. Zalinski explained the working of the gun to a large number of visitors who had been invited to witness the trial. An illustrated description of the gun and its mode of operation appeared in the SCIENTIFIC AMERICAN of Oct. 31. When the projectile containing 100 lb. of dynamite struck the water, it sent up a column of spray 150 feet into the air, accompanying which was a cloud of yellow smoke and a report similar to that made by heavy ordnance. The air pressure employed was 1,000 pounds to the square inch, and this, so admitted as to realize a large part of its expansive force in the long gun, gave the needed velocity to the projectile, without a sudden concussion at starting, as would have been the case with gunpowder, all according to the anticipations of Lieut. Zalinski. The practical demonstration thus afforded that the most powerful of modern explosives can be thus handled, even though the range is as yet comparatively short compared with that of the best modern guns, marks another and most important step in the development of the means afforded for carrying on modern warfare.

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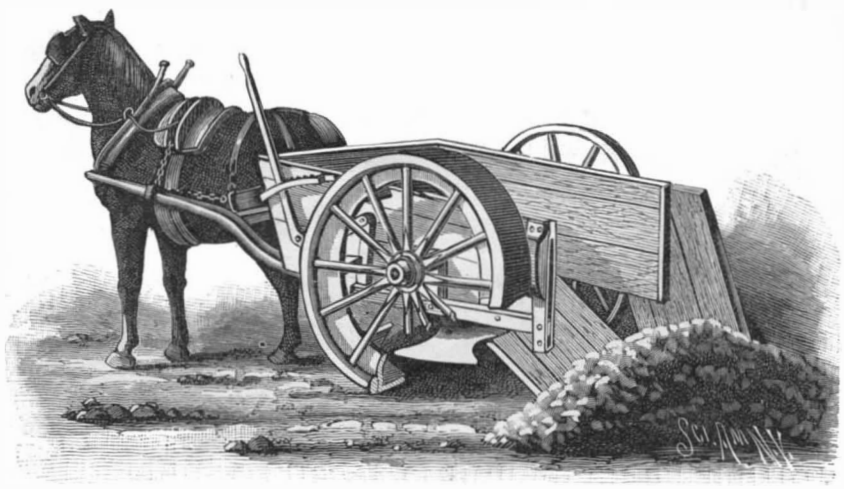
GRADING AND DITCHING MACHINE.

The cart is provided with a tilting bottom, and is carried upon one plain wheel and upon one wheel formed with buckets upon the inner side at the rim. On the side of the rear of the cart next to the bucket wheel is secured a knife, which serves to remove any dirt that may extend beyond the inner side of the bucket wheel. A plow for filling the buckets is attached to a beam provided with a lever mechanism, by means of which it may be raised and lowered as desired. As the cart is drawn forward, the earth is thrown by the plow into the lowest buckets; as the wheel revolves, the buckets dump the earth upon an inclined board, resting upon the top of the side of the cart, and down which it slides to the inside. When full, the cart can be taken to any convenient place and its load dumped.



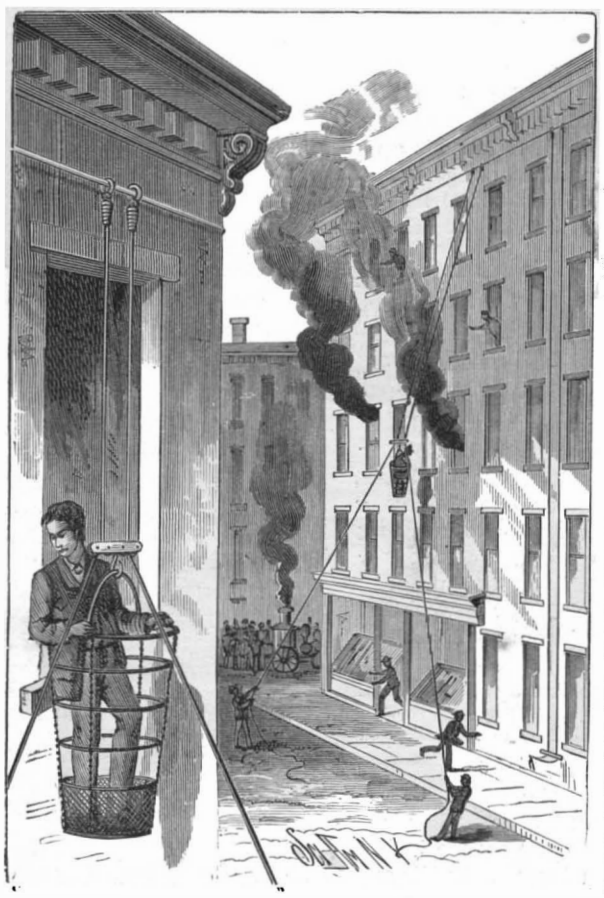
TOBIAS' GRADING AND DITCHING MACHINE.

This invention has been patented by Mr. Benjamin Tobias, of Washington, Ill.

IMPROVED FIRE ESCAPE.

The prevalence of destructive and fatal fires in the larger cities during the past few years has called forth a strong effort on the part of our inventors to devise efficient means for the rescue of those imprisoned in burning buildings. We have illustrated several of these devices from time to time, and in our present issue show one which has recently been patented by Mr. Thomas Macdonough, of Cheboygan, Mich.

It is the merit of the invention that it scarcely needs explanation, since our illustration tells the whole story at a glance. A strong metallic cable is stretched along the front of the building just below the cornice. Movable rings support vertical cables, which are connected in pairs by means of iron cross bars. These bars are provided with two friction wheels at each end between which the cables pass. A strong hook on the cross bars permits the suspension of a metallic basket, which,



MACDONOUGH'S IMPROVED FIRE ESCAPE.

when in use, is brought to the level of the window sill, so that a person can readily step into it. The device is manipulated by two persons on the street, who raise the frame and basket by separating the lower ends of the cables, and allow them to descend by approaching each other. The speed of the descent is thus regulated at pleasure, and the rescued persons may be landed on the opposite side of the street, away from the burning building. The baskets are made telescopic, so as to occupy but little space when not in use, and are kept in the different rooms of the building.

Practical tests of this escape have been made in Detroit and other places in the West, and its action pronounced very satisfactory. Being entirely metallic, it is fireproof, and may be kept in service as long as the strength of the building will permit.

Percentage.

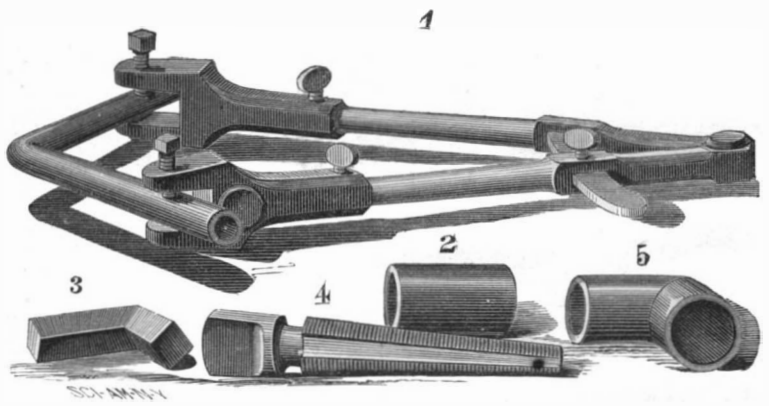
The reckoning of percentages, like the minus sign in algebra, is a constant stumbling block to the novice. Even experienced newspaper writers often become muddled when they attempt to speak of it. The ascending scale is easy enough. Five added to twenty is a gain of 25 per cent; given any sum of figures, the doubling of it is an addition of 100 per cent. But the moment the change is a decreasing calculation, the inexperienced mathematician betrays himself, and even the expert is apt to stumble or go astray. An advance from twenty to twenty-five is an increase of 25 per cent; but the reverse of this, that is, a decline from twenty-five to twenty, is a decrease of only 20 per cent.

There are many persons, otherwise intelligent, who cannot see why the reduction of one hundred to fifty is not a decrease of 100 per cent, if an advance from fifty to one hundred is an increase of 100 per cent. The other day an article of merchandise which had been purchased at 10 cents a pound was resold at thirty cents a pound, a profit of 200 per cent; whereupon a writer, in chronicling the sale, said that, at the beginning of the recent depression, several invoices of the same class of goods which had cost over thirty cents per pound had been finally sold at ten cents per pound, a loss of over 200 per cent. Of course, there cannot be a decrease or loss of more than 100 per cent, because this wipes out the whole of the investment. An advance of from ten to thirty is a gain of 200 per cent; a decline from thirty to ten is a loss of only 66⅔ per cent.—*Jour. of Commerce.*

IMPROVED METAL TONGS.

These tongs are designed to enable the blacksmith to do the most difficult jobs of welding without the use of helpers. Fig. 1 is a perspective view of the tongs, with two sections of pipe clamped in them ready to make the miter weld shown in Fig. 5; Fig. 3 shows a miter weld of two pieces of one-half inch square bar; Fig. 2 shows a section of gas pipe butt welded; and Fig. 4 represents a taper tap that was broken in the center, and which the inventor of these tongs, Mr. William W. Winegar, of Chambersburg, Ill., brazed together, making the tap as good as it was before being broken.

To the forward end of each of the arms is secured, by means of a set screw, a clamp, in the upper jaw of which is a screw; these clamps are provided with long necks into which the ends of the arms fit. This construction allows the clamps to be pushed up or down on the arms, to lengthen or shorten them as required, and by means of the screws the clamps may be held at any desired angle. The arms are held at any distance apart by a curved bar attached to one arm and passing through a slot in the other. When the tongs are in use, the pieces to be joined are placed in the clamps and held by turning down the screws, the clamps having been first adjusted on the arms to suit the shape of the pieces. After the pieces have been properly set in the clamps, the arms are brought together, and held firmly by turning the screw down on the curved bar. The pieces are then in position for soldering, welding, or brazing. It will be seen that the operator has complete control over his work, and gains much time in bringing the two parts together. In joining the pieces, instead of striking their ends, the clamps may be struck on projecting side pieces, thereby preventing damage to the ends of the parts. The device is exceedingly simple, is durable and efficient in use, and can be made at a small cost.

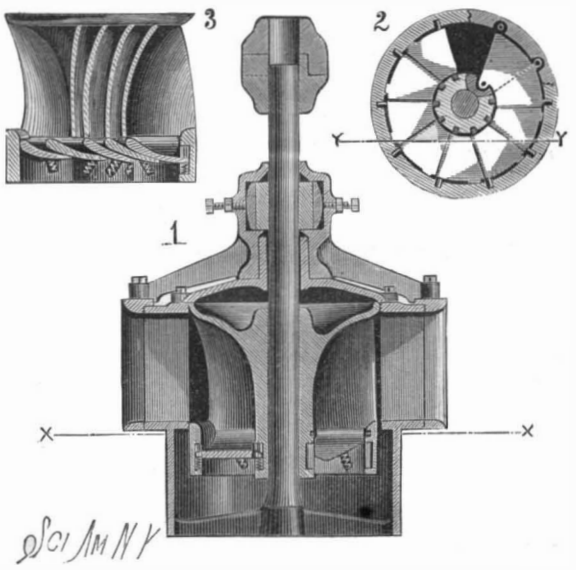


WINEGAR'S IMPROVED METAL TONGS.

MR. C. H. CHASE, of Bridgewater, N. S., writes to us that, contrary to the generally accepted belief, the first gold found by James Marshall in California was not on the Sacramento River, but on one of its tributaries, the Feather, about 45 miles above the city of Sacramento, and within the limits of the present city of Marysville.

GATE FOR WATERWHEELS.

The invention herewith illustrated—patented by Mr. D. L. Trullinger, of Union Mills, Oregon—consists of a waterwheel having a series of hinged discharge gates, so constructed and arranged that springs regulate their opening or closing, according to the pressure and the amount of water supplied. Fig. 1 is a vertical sectional elevation of a waterwheel, showing the gates partly open; Fig. 2 is a plan view on line *x x*, and Fig. 3 a vertical section on line *y y*, showing the gates closed. The waterwheel, of any approved construction, is inclosed in a casing provided with the usual chutes. Directly under each bucket is hung a gate



TRULLINGER'S GATE FOR WATERWHEELS.

formed with trunnions placed in bearings in the rim and hub of the wheel. The gates are arranged radially and form bottoms for the buckets, and each is curved downwardly and overlapped by the one next following. On the inner and outer edges of the gates are lugs entering segmental grooves formed in the hub and rim; these lugs rest on springs. The weight and presssure of the water on top of the gates swing one end downward, thereby opening them to discharge the water. The springs are compressed by the lugs, according to the pressure of the water supplied, and the gates are thus kept open as long as the pressure is exerted, and close or open still more if the pressure be diminished or increased; this permits the pressure of the water to be kept the same inside of the casing, whether the gates are fully or only partially open.

Cleaning Water Pipes.

An experiment of cleaning main water pipes of incrustations by means of chemicals was successfully accomplished last year in Leipzig. The main pipe between reservoir and the pump, 2·8 miles long and 15⅓ inches in diameter, was covered with incrustations about one inch thick. The cleaning lasted two months, and during this period the main pipe was filled eight times with solution of hydrochloric acid, three times with solution of soda, and once with solution of chloride of lime. By this means the incrustations were entirely removed, and the gauges at the pumps showed pressure 30 pounds less than before.

California Sea Lions.

The thousands of sea lions which occupy the bays and coast near San Francisco are under the vigilant eye of the Fish Commission. The animals are very voracious, and are stated to devour hundreds of thousands of pounds of edible fish daily. The fishermen declare that they make hard times in their business. Their curious manner of living upon the rocks around Golden Gate makes the beasts one of the sights of the city, and one seldom neglected by tourists. It may be decided to protect the lions within a national reservation instead of trying to exterminate them. They will be made the subject of an exhaustive report to the Commission.

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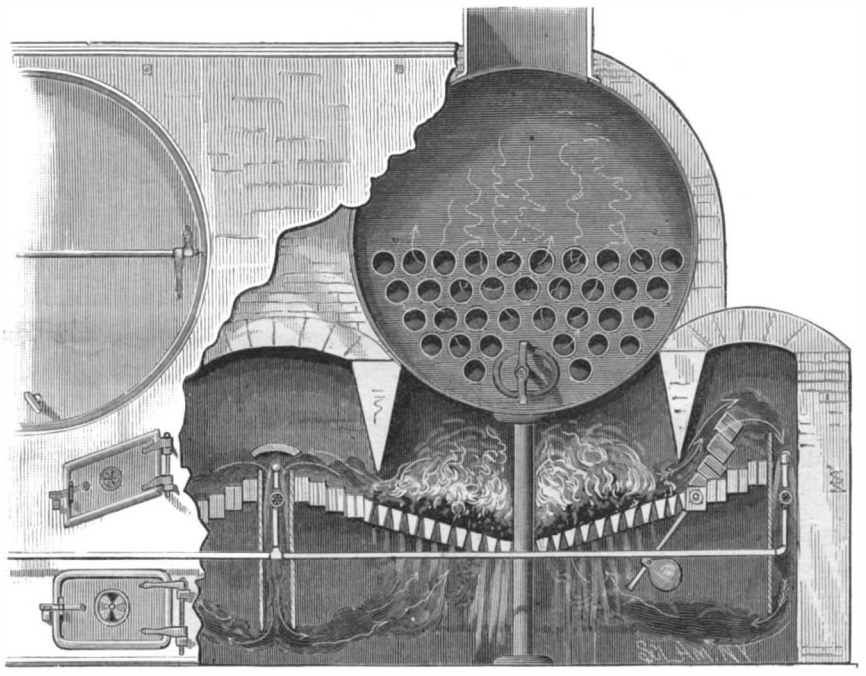
SMOKE CONSUMING FURNACE.

In our issue of August 22 last, we described an admirable smoke consuming furnace devised by Mr. John L. Peslin, of Appleton, Wis. Though it was susceptible of some improvements in the minor details, its construction embodied the correct principles of the chemistry of combustion. Since that time, Mr. Peslin has been at work making these improvements, and in the modified form illustrated in our present issue he has incorporated them in a construction applied to a battery of boilers. It will be noticed that the feeding is effected from the front instead of from the top, as formerly.

We show the end boiler of a battery, with the front plate broken away in order to disclose the construction. The grate bars immediately under the boiler are made with a straight pitch, and incline toward the center. At their upper ends they are in line with step grates of fire-clay, which receive the fresh fuel. These in their turn terminate against the sheet metal forming the sides of the smoke chamber. A cast iron guard, of curved cross section, extends over the top of this chamber to prevent the fuel from falling through into the ash pan. The fresh coal is introduced into the chamber over the step grate, where the heat is sufficient to partially coke the coal. The smoke and volatile products given off, instead of finding their way to the stack, are drawn into the smoke chamber by a downward blast of steam. They then pass under the grate and through the layer of burning coals, where they are thoroughly consumed, the gases being ignited and the suspended particles of carbon brought to the temperature of combustion. The fuel, now deprived of its smoke producing constituents, is ready to be brought upon the grate. This is effected by turning a lever that tilts the step grate into the position shown at the right hand of our engraving, by which the coke is thrown into the zone of combustion. A weight on the end of the lever counterbalances the grate and fuel, making this operation easier for the fireman.

Such an arrangement of the furnace insures the combustion of every part of the fuel, utilizing its entire heat energy, and at the same time preventing the smoke nuisance. It gives the advantages of coke and the heat economy of coal.



PESLIN'S SMOKE CONSUMING FURNACE.

Oldest Habitations in America.

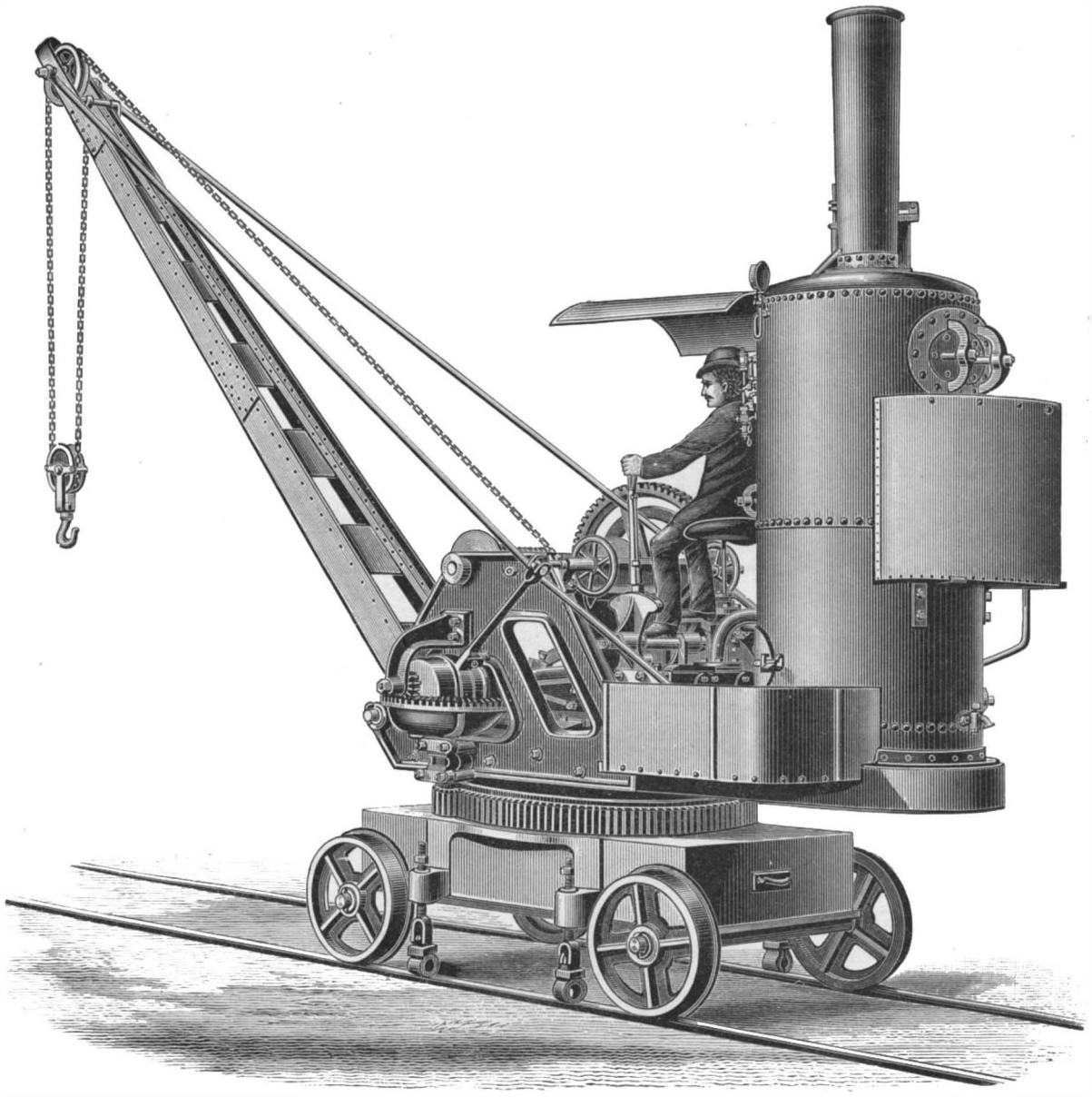
Major Powell, Chief of the Geological Survey, who has been about a month in the field, has discovered in New Mexico, near California Mountain, what he pronounces to be the oldest human habitation upon the American continent. The mountains in this vicinity are covered with huge beds of lava, in which the prehistoric man and his comrades excavated square rooms, which were lined with a species of plaster made from the lava, and in these rooms were found various evidences of quite an advanced civilization, among them a species of cloth made of woven hair and a large number of pieces of pottery. In the sides of the rooms cupboards and shelves were excavated. In one room, sticking out of the bare face of the wall, was a small branch of a tree. When this was pulled out, it was found that there was a hollow space behind the wall. Colonel J. H. Stephenson, Major Powell's assistant, broke this with a pick and found a little concealed niche, in which was a small carved figure resembling a man done up in a closely woven fabric, which with the touch of the hand turned to dust. It was blackened and crisp, like the mummy cloths of Egypt. In all, some sixty groups of these lava villages were found, there being twenty houses in each group. The evidences of civilization were similar, but removed by their crudity and want of skill a good deal from the articles found in the cliff houses.—*Santa Fe New Mex.*

A New Island in the Pacific.

The United States Consul in Samoa has advised the Merchants' Exchange of San Francisco that a new island has been thrown up in the Pacific Ocean. It is about forty miles off the Tonga group, bearing toward the Fiji Islands. Its appearance has a practical importance, since it is in the track of California vessels. The island is two miles long and 250 feet high. It is in latitude 20 deg. 28 min. south, and longitude 175 deg. 21 min. west.

THE CONTRACTOR'S CRANE.

A new portable crane, embodying all the essential features which should be present in an apparatus of this class, and which are here combined with lowness in price, has recently been brought out by Messrs. Alexander Shanks & Son, London, Eng., and Dens Ironworks, Arbroath. From an inspection of our engraving, for which we are indebted to *Iron*, it will be seen that the carriage on which the crane rests is formed of one strong casting—an arrangement which secures rigidity in working, and is thereby a decided improvement over the more yielding wrought iron carriage.



THE CONTRACTOR'S CRANE.

The sole plate which carries the boiler, and to which the side frames are bolted, is also one strong casting. The engine has two cylinders placed horizontally on the sole plate, and motion is communicated to the crank shaft by connecting rods in the usual way. The center post on which the crane turns is of wrought iron. Link motion for reversing is provided. The cranes are made to hoist or lower and turn round by steam, the two motions being performed simultaneously if desired. A powerful friction brake is provided, by means of which the load may be suspended or lowered. The crane is fitted with single motion, and lifts its maximum loads by double chain.

The same speed of lift can be attained in this way as by double gear and single chain, and the former arrangement possesses the advantage of having fewer working parts and clutches than the latter, and less liability to derangement. A separate and larger winding barrel, 14 inches diameter and 14 inches long, can be provided if required. This barrel can be attached to the crane barrel in a few minutes, and by means of it light loads can be raised by single chain at a very quick speed.

The crane has thus the advantage of the following variations in the speed of lifting its load, which in practice will be found of the utmost convenience, viz.: By double chain, the maximum load can be lifted at about 40 feet per minute; by single chain, half the maximum load at about 80 feet per minute; and by the barrel of larger diameter lighter loads can be lifted at about 160 feet per minute. The boiler, a most important part of a steam crane, has large heating surface, and steam can be kept up without extra effort in firing.

A water tank is attached to the boiler, which is fed by means of an injector. The jib, which has a radius of 16 feet, at an angle of 45°, is of wrought iron. A small canopy is provided to protect the driver, is within easy distance of the starting handles, and at the same time commands an uninterrupted view of the hoisting chain.

New British Army Service Rifle.

The decision of the committee which was appointed some time since to consider what form the new military rifle should take is that the diameter of the bore is to be 0·40 inch in place of the 0·46 inch of the Martini-Henry, and the weight of the bullet is to be reduced 96 grains, being 384 grains in place of the old weight of 480 grains. The powder charge, however, remains as before, namely, 85 grains. There will be 9 grooves in the rifling in place of seven as before, and the pitch will be 15 inches in place of 22 inches. The muzzle velocity will, by these means, be increased 255 feet a second, that is to say, from the original 1,315 feet per second to 1,570 feet per second. The practical advantage that will follow will be that the trajectory will be so far lowered, and at 500 yards the bullet would not go much, if any, above the head of an average soldier if fired from the ground. In the old rifle the rise would be between 8 feet and 9 feet in the same distance.

The recoil is said to be much less with the new weapon, and, to judge by trials made, accuracy of shooting generally has been far more nearly approached than before. Trials are yet to be made with a view to determining whether it will be advisable to add a detachable magazine to the arm.

GAS was struck a depth of 50 ft., near Cameron, N. Y.

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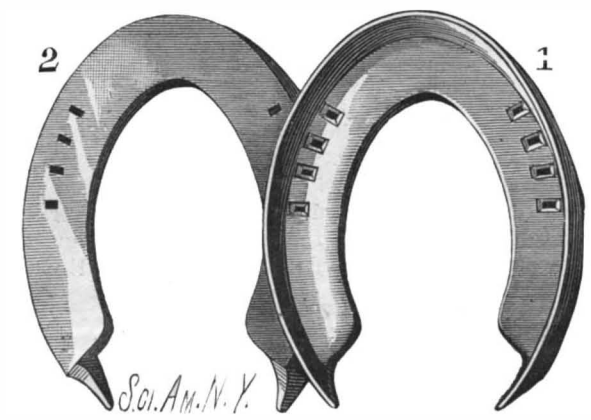
The Proper Weight of Man.

Professor Huxley asserts that the proper weight of man is 154 lb., made up as follows: Muscles and their appurtenances, 68 lb.; skeleton, 24 lb.; skin, 10½ lb.; fat, 28 lb.; brain, 3 lb.; thoracic viscera, 3½ lb.; abdominal viscera, 11 lb.; blood which would drain from the body, 7 lb. The heart of such a man should beat 75 times a minute, and he should breathe 15 times a minute. In 24 hours he would vitiate 1,750 cubic feet of pure air to the extent of 1 per cent. A man, therefore, of the weight mentioned should have 800 cubic feet of well ventilated space. He would throw off by the skin 18 oz. of water, 300 grains of solid matter, and 400 grains of carbonic acid every 24 hours; and his total loss during that period would be 6 lb. of water and a little more than 2 lb. of other matter.

AN IMPROVED HORSESHOE.

The improved form of horseshoe shown in our illustration is the invention of Mr. James S. Charles, lock box 694, Omaha, Nebraska. In the first figure the under side of the shoe is represented, and in the second the top view. The body of the shoe is provided with a continuous, vertical flange, which has its edge sharpened and hardened by means of a new process devised by the inventor. The flange extends somewhat beyond the ends of the main body of the shoe, and is beveled into a sharp point. This feature is intended to give the shoe a greater hold on the roadway than can be obtained by the ordinary construction. The nail holes formed in the web are countersunk, as shown. They have their longer dimensions radiating toward the center, so that the thin part of the nail shall enter the hoof in the direction of its fiber, and do as little injury as possible. By driving the nail in the line of least resistance, the labor of shoeing is reduced, and there is less danger of splitting the hoof. While this form of nail hole is not essential to the invention, it is regarded as much the preferable construction. Should it be desired, however, the shoe may be made with the ordinary openings.

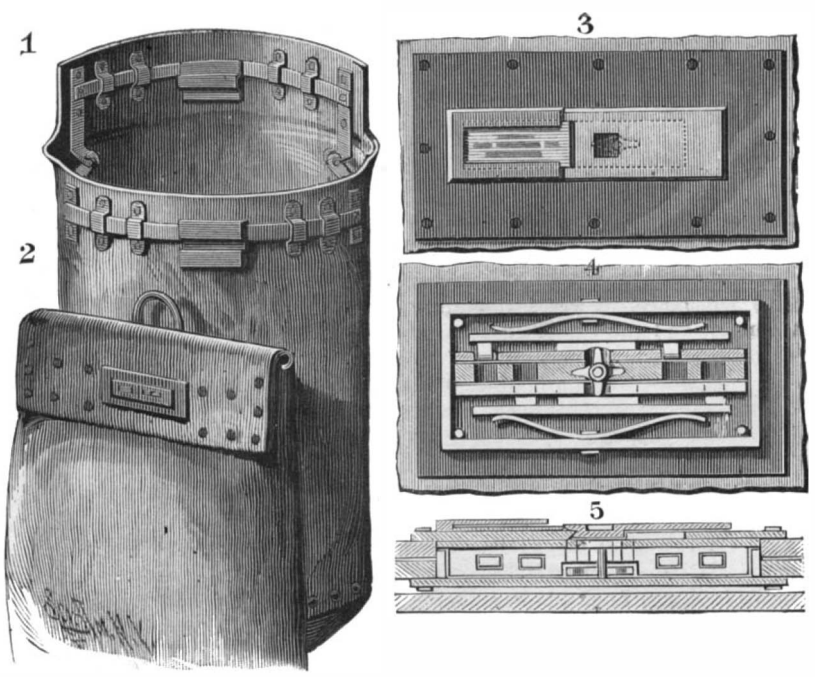


CHARLES' IMPROVED HORSESHOE.

IMPROVED MAIL BAG AND LOCK.

The accompanying illustrations show a mail bag and lock designed to do away entirely with the long strap, the staples, and the padlock heretofore used, substituting a lock which becomes a part of each mail bag, and is never detached therefrom. Figs. 1 and 2 show the bag open and closed, Fig. 3 is an enlarged face view of the lock, Fig. 4 showing the same with the front plate removed and parts shown in section, while Fig. 5 is a longitudinal sectional view. The bag has springs on the inside of the flap, and permanently attached thereto, to keep the mouth of the bag open when the flap is raised, thus holding it in the best position to facilitate the emptying and filling of the bag with mail matter. The lock is simple in construction, and perfectly solid when closed, so that if run over by a wagon it will not be injured. It is difficult to pick or force open in any way the locking bars carrying lugs, and being pressed by springs against recessed partitions of the lock casing. On the top surface of the front plate undercut ribs are formed for receiving and holding a ticket on which may be printed the station to which the pouch is to be returned, or the postal division, etc. The lock casing is attached to one flap of the bag, and the top plate to the other. The bag is locked by a slight pressure on closing, and the lock, springs, hinges, and swivels surrounding the mouth of the bag cannot be cut or removed by any ordinary means. This improvement is applicable, at but moderate cost, to all the old mail bags, while it can be applied to all new ones at an expense not to exceed that incurred for the present unsatisfactory fastenings.

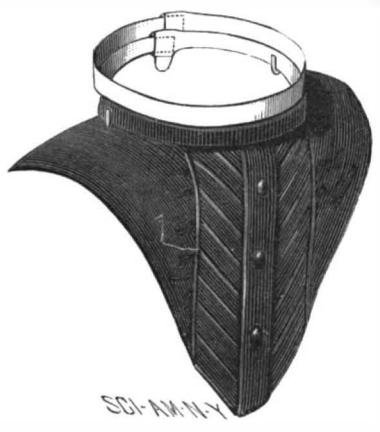
These inventions have been patented by Mr. Dennis P. Brophy, of Nokomis, Ill.



BROPHY'S IMPROVED MAIL BAG AND LOCK.

STOCK AND COLLAR.

This invention particularly relates to stocks and collars such as are used by clergymen, in which a band-like collar, designed to encircle the neck and opening at the back, is used and combined with a stock usually made to present a black fall in front and to expose a portion of the collar above it. One end of the collar is formed with a pocket that receives the other end when the collar is placed around the neck. This construction forms a ready means for putting the collar on and taking it off, and also gives an easy or yielding fit, and adapts it to different sized necks; it also provides for expansion of the collar without exposing a break where the two ends meet. An inner encircling spring serves to support the collar and give it elasticity circumferentially. This spring forms part of the stock, the material of which covers it; one end of the spring enters a socket in the other end. The stock is also made with an outer black strip, above the fall, arranged to encircle or partly encircle the collar, which is exposed above it. The collar and stock are held firmly together, but may be easily separated when necessary. It will be seen that the stock and collar present a neat appearance, and the latter is free from the unsightly break so common in articles of this description.



This invention has been patented by Mr. B. J. Kolb, of Glandorf, Ohio.

The Coventry Locomotive Boiler.

At a recent meeting of the Engineers' Club at Philadelphia, Mr. John T. Boyd presented an illustrated description of the "Coventry" locomotive boiler, which is probably the latest novelty in locomotive construction.

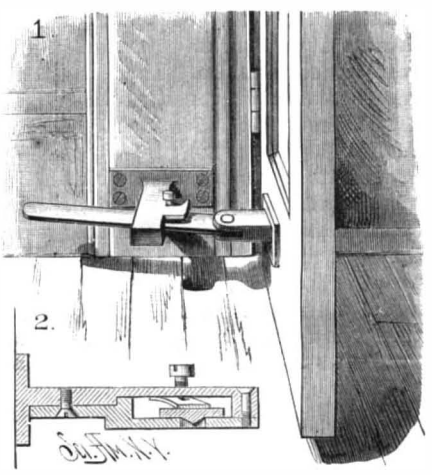
It was built at the Brooks Locomotive Works, Dunkirk, N. Y., and placed on one of their standard 17 in. by 24 in. engines, with 61 in. drivers. The economy of the boiler as a steam generator has not been made public, but while in service on the New York division of Penna. R.R. it has proved to be almost absolutely free from smoke and cinder discharging qualities. The boiler is of the straight top return tubular type, is made of Otis steel throughout, and is remarkable in having but two barrel sections, excluding the smoke box. The stack is "behind instead of before," and is located over the front end of what might be called the upper crown sheet, which forms the bottom of the back combustion chamber, which is directly over the fire box, the stack itself rising from top of boiler between the cab and dome. The crown sheets are self-sustained by long stay bolts opposing the pressure in inside of boiler.

Access to the back combustion chamber is had by means of a manhole in the rear head of boiler, through which the exhaust nozzles and lift pipes are put in position. The lower or 2 in. tubes are arranged as in the ordinary locomotive, while the upper or 3 in. tubes are grouped around the drypipe as it passes from the dome to the "T" head in smoke box. In order to get the exhaust steam from the cylinders into the stack, side pipes, provided with expansion joints after leaving the smoke box, are placed outside of but close to the boiler jacket, and enter the back combustion chamber close to the base of the stack.

The throttle lever is turned "upside down" to get a pulling motion to open the throttle, and the rod is forked to pass around stack at its base in order to reach the bridge pipe at dome. The steam supply for injectors, air brake pump, heater cocks, cylinder oilers, blower, etc., is brought from bridge pipe in two pipes, one on each side of boiler. The mud ring in water leg is shaped to take the curved sides of the back head, and allow the outside side sheets of the fire box to lie straight against the edge of the ring, thereby reducing "scarfing" the edges of the back head to a minimum, if not dispensing with the "scarfing" altogether. The boiler is 61 in. in diameter, 23 ft. 4 7/16 in. long, and is of ½ in. steel. The barrel contains 152 2-in and 43 3-in. tubes, each 11 ft. 5⅛ in. long. The fire box is 5 ft. 10 in. long by 34 in. wide, and crown sheet about 4 ft. above grates. Total heating surface is about 1,265 sq. ft. Weight of boiler alone is 23,000 lb.

DOOR CHECK.

The device herewith illustrated holds the door open when desired, and yet does not interfere with the opening and closing. Secured to the door frame, near the floor, is a plate from which a flat jaw projects horizontally, the top of the jaw being provided with a lug projecting toward the door. In the jaw is an opening, through which is passed a flat bar, one end of which is pivoted in jaws projecting from a plate secured to the door. In the bottom of the opening is a hole for receiving a beveled nipple on the under side of the bar, as shown in the sectional view, Fig. 2. A flat spring provided with an adjusting screw presses the bar down. When the door is being opened or closed, the bar slides through the opening; and when the nipple enters the opening, it is pressed into the hole by the spring and the door held. By exerting sufficient power the nipple can be pulled out of the hole, when the bar is free to slide in the opening. The pressure of the spring on the bar produces enough friction to prevent the door swinging too easily. The door can be held open more or less by placing the nipple at different distances from the end of the bar.



MAURER'S DOOR CHECK.

This invention has been patented by Mr. Adam Maurer, of 210 Elm Street, San Antonio, Texas.

Caution to Amateur Electricians.

Certain printed instructions for the preparation of the chromic acid solution for batteries direct that the sulphuric acid be poured into *hot* solution of potassium dichromate; unless this be carefully done, small portions of the oil of vitriol may be projected into the face of the operator. Bunsen's method is preferable; mix the dichromate, in granular form, with the sulphuric acid, then add *cold* water, with continued stirring; the union of the acid and water generates sufficient heat to speedily effect the solution of the salt.

Carp Planted in Rivanna River.

On June 25, 1885, Colonel M. McDonald took from the carp ponds at Washington seventy-five thousand carp from three to ten days old, and deposited them without loss at Charlottesville, Va., in the Rivanna River. The oldest of the fish were from 1¼ to 1½ in. in length. Only a few of the fish died in transit. The river selected is a muddy stream containing no other fish, except suckers. The dams below Charlottesville prevent the ascent of bass and other predaceous fish from the James River.—*Bulletin U. S. Fish Commission.*

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THE KNICKERBOCKER AVENUE EXTENSION SEWER, BROOKLYN, N. Y.

[SEE FIRST PAGE ILLUSTRATION.]

The city of Brooklyn is now building a sewer, having an area equal to that of a circle 12 feet in diameter, from the junction of Knickerbocker and Johnson Avenues, through Johnson Avenue and South 5th Street, to the East River. The necessity for the work is apparent from the fact that the present outlet sewer for this section of the city, which drains an area of about 2,800 acres, some of which is very low and flooded by every rain, is discharged upon the low lands at the head of Newtown Creek, making a nuisance greatly detrimental to public health and damaging to valuable property in the vicinity. Frequent complaints from people living near this outlet and by the Department of Health rendered the construction of a new outlet absolutely necessary.

Although there is nothing new either in the sewer itself or the duty it is designed to perform, the method of building one section of about three-quarters of a mile in length is certainly unique and interesting. Owing to the depth of the grade lines of the sewer below the street surface, in the greater portion of section one (next the river), and the danger to heavy buildings on both sides of South 5th Street, it was thought better to prosecute the work by means of tunneling rather than by open trench. Our frontispiece is composed of views showing the manner of prosecuting the work, both in the tunnel and in the open cuts.

The section of the sewer for almost its entire length is circular, 12 feet in diameter inside; and where it has been essential to alter this form, the sectional area has been made the same. The sewer is built of brick laid in cement, and the minimum thickness is 12 inches. At some points a foundation was made of transverse and longitudinal timbers, and the brick invert was reduced in thickness to 8 inches, between which and the timber was a bed of concrete. Where necessary, retaining walls, 3 feet thick at the bottom, 2 feet thick at the top, and extending a short distance above the center line of the sewer, were built. For the greater part of the tunnel section, the work passes through sand, and the sewer is a simple ring of brick. At each crossing street is a manhole, 3 feet in diameter, where it joins the arch, 2 feet in diameter at the surface, and in height varying with the depth of the sewer below the street. The outer end of the outfall is 18 feet in width and 6½ feet in height, measured from the center of the invert, the curve of which has a radius of 41 feet; the sides are vertical, and on them rest iron I-beams, 12 inches deep, and varying in length from 20 feet at the outer end to 13 feet where the outfall sewer joins the circular one.

The general method of prosecuting the tunnel portion of the sewer has been to sink shafts at about every 700 or 800 feet, and then drive the headings each way. Fig. 1 represents the shaft on South 5th Street near 5th, which is 64 feet in depth to the bottom of the invert. The sides are held by sheet piling, and extending through the center are guides for the cage, the machinery for operating which is in the building shown at the right. A track is laid down each tunnel to the heading, as shown in Fig. 5. The cars filled with the excavated material are run to the bottom of the shaft, raised to the surface, and run to the dumping ground. Just east of 5th Street it was necessary to build a short section (Fig. 3) by open cut, and after this had been completed, the earth for filling in was obtained through the shaft shown. Fig. 2 shows the dumping car here used. The faces of the forward wheels are narrower than those of the rear ones, thereby permitting them to pass between the ends of the rails, which are inclined upward at a sharp angle, and rest in the curved parts of inner rails. The rear wheels mount the inclined rails, thus tilting the car and dumping the load.

Fig. 5 is a view looking into the heading, and Fig. 6 is a longitudinal sectional elevation of the same. The pilot tunnel here used is the invention of Mr. J. F. Anderson, and was first used upon the Hudson River tunnel; the duty it performs in its present location is precisely similar to that it performed under the river. The pilot is 5½ feet in diameter, and is made up of interchangeable flanged iron plates, bolted together. It is kept as near as possible in the center of the tunnel, and is extended some distance ahead of the finished masonry, the advance being made by removing the rear plates, carrying them forward, and bolting them to those already in place. The forward end of the pilot being in undisturbed ground, and the rear end being firmly held by radiating struts resting against the masonry, there is formed a rigid center or hub from which the work can be braced.

In the heading, the earth at the crown is removed and an iron plate inserted; this plate is bolted to the one already in, and is held by a strut against the pilot. These plates, unless the earth is very treacherous, are only carried about half way down each side. After the plates have been put in far enough, the section next the masonry is cleared, and a portion of the brickwork built.

This method of tunneling not only gives an exact idea of the nature of the material in advance of the main work, but also serves to firmly hold the sides of the excavation, preventing caving in; and where the route extends through a street lined upon each side with houses, and, as in this case, at an unusual depth below the surface, it has many advantages over the ordinary open cut. In addition, it occupies the street only at the shafts, so that travel is not much interfered with.

Fig. 4 shows an open cut portion of the work. Before beginning operations, the old sewer was removed and a new one built under each sidewalk, as a temporary measure during construction. A platform carrying the hoisting machinery extends across the trench, and is mounted upon wheels running upon tracks laid at the edge of the opening. The sides are held in the usual way by sheet piling braced by timbers extending across the opening, and which also carry the gas and water mains.

It is estimated that the total cost of the sewer—which will be finished in a short time—will be $575,000.

IMPROVED CORK ATTACHMENT.

The art of bottling liquids has attained quite large proportions as a distinct business. The machinery and appliances for driving and fastening the corks have been well studied, and brought to a considerable degree of perfection. But the reverse process, that of unbottling, has received less attention. It is usually left to the individual to struggle with the wires and a corkscrew as best he can. If the cork be of good quality, and not too tightly wedged, he succeeds fairly well; but it often happens that this is not the case, and numerous fragments of cork, perhaps the largest portion on the inside of the bottle, is pretty sure to be the result. We illustrate the cork attachments devised by Mr. John W. Hayward, of St. Johns, Newfoundland, which makes it as easy to get a cork out of a bottle as it is to drive it in. An ordinary cork, O, of the required size, has a piece of strong non-corrosive twine, 1, let into its sides. A button or shield, 5, also non-corrosive, is placed on the inner end of the cork to prevent the twine cutting through it. A hand metal tag, 2, is secured on the twine where it is knotted, or in case a capsule is placed on the end of a piece, 4, which hangs below the capsule.

HAYWARD'S IMPROVED CORK ATTACHMENT.

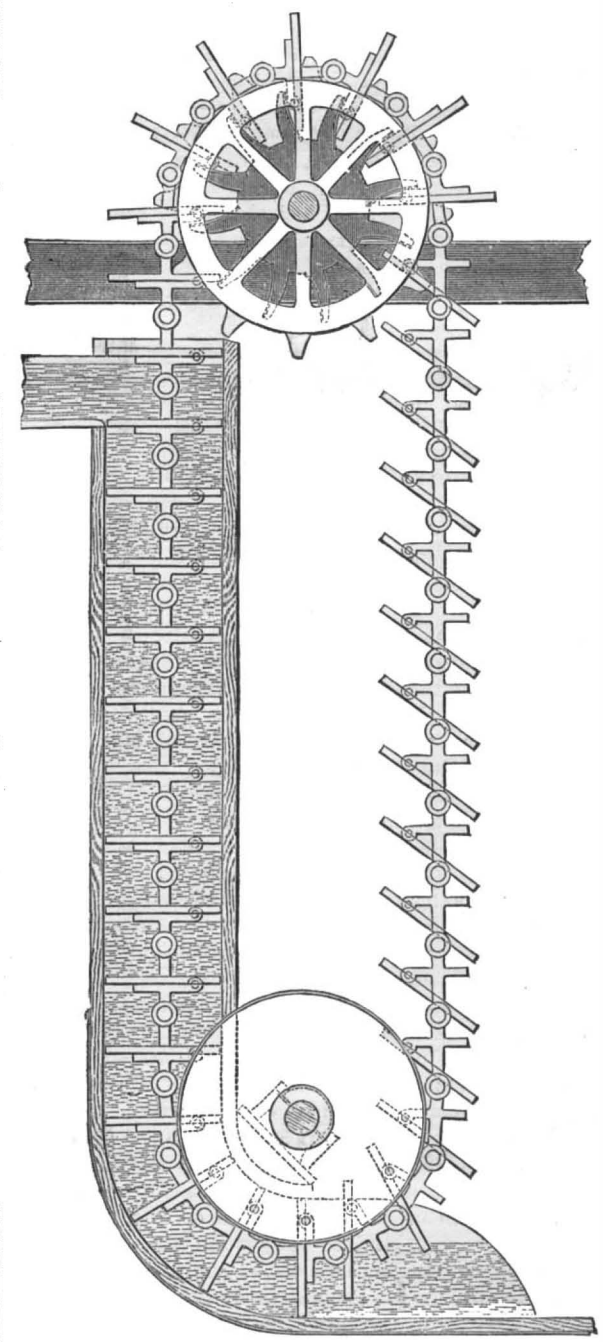
A rubber button, 3, placed on the outer end of the cork, has a hole or slit through which the twine passes. In 6 is shown the wire attached to the bottle neck, 6^1 representing the hook, and 6^2 the manner of locking it in place. 7 gives the appearance of a bottle when corked and the twine secured on the wire hooks. In 8, a capsule has been placed over the cork, and the tag is seen protruding beneath its edge. 9 shows the manner of securing the twine over the wire by stretching the elastic button, 3, and 9^1 the top view of the bottle when the operation is completed.

When the cork is being driven into the bottle, the rubber button is turned over on the twine and tag, as shown in 10, to protect them from injury. The button is then reversed, one loop of the twine passed under the wire hook on one side, and by stretching the rubber button the other loop secured on the opposite hook. The process of unbottling is shown in our last figure. The tag is grasped, and by an upward twist the capsule is torn open. The twine is disengaged from the wires, and, by passing the first and second fingers through the loop, the cork can be readily drawn. This system does away with the corkscrew entirely, each cork carrying its own means of release. It is applicable for any liquids, medicines, liquors, inks, etc., and as the corks are not injured they may be used a number of times. Mr. A. B Cohu, 197 Water Street, New York city, has the agency for this attachment.

BALANCED WATER MOTOR.

At the Inventions Exhibition, London, Sealey Allin, Queen Victoria Street, shows a patent balanced float water motor, with which he claims to obtain a working efficiency of over 90 per cent. Our illustration is from the *Engineer*. It consists of a series of feathering floats, hinged to a chain which works over a pair of drums, the floats on the descending side being inclosed in a casing, so as to form a series of moving chambers, which are successively filled with water as they enter the casing.

A cross section of the casing is shown in the annexed sketch. A A are planed grooves, in which slide projecting pieces forced on each link of the chain, the clearance being limited to one-sixty-fourth of an inch. The clearance of the floats themselves can, therefore, be made very small, and the inventor states that in this way he has been able to reduce the loss from leakage to a comparatively insignificant amount. The feathering of the floats is automatic, and is regulated by the level of the tail water; for so long as the pressure of water behind is greater than the resistance in front, the chain is pushed forward. As soon, however, as the resistance exceeds the pressure, the floats fall away from the chain, and rise nearly vertically out of the water. The power is taken off from the top drum, which is provided with specially formed teeth, which take each link of the chain as it passes over. The speed of the chain is about 180 feet per minute. Assuming that the difficulties of construction have been overcome, there seems no reason to doubt that the efficiency of such a motor as this will be much greater than that of even the best waterwheels, as a greater percentage of the fall can be utilized.



ALLIN'S WATER MOTOR.

It must not, however, be forgotten that hitherto, in the majority of cases where waterwheels have been applied, economy of water has been a secondary consideration, and there is, after all, something very fascinating in the simplicity of a waterwheel. What it may be in the future is, of course, a different matter. Probably, if any serious attempt is made to take advantage of the power to be derived from natural falls of water, or, as Mr. Allin proposes, of the rise and fall of the tide, more attention will be paid to efficiency; and if, as is stated, about 93 per cent of the actual energy can be given off in useful work, there may be a considerable field for Mr. Allin's invention.

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The Colorado Oil Field.

According to the *Petroleum Age*, Mr. David Kirk, President of the McCalmont Oil Company, lately visited the oil field which is located on the plains of Florence, ten miles southeast of Canon City, on the Denver & Rio Grande Railroad. The four wells now producing are owned by three different companies, and have an aggregate production of ten barrels. They are situated on a stretch of ground about three miles in length and with its width undefined. One small well was drilled north of the better ones, but no dry holes have been found, and the extent of the territory is a matter of conjecture. The wells produce the maximum amount of oil when they are pumped by heads twice a day. When the walking beam is kept constantly wagging, the wells do not produce any more oil than when they are pumped by heads.

The best well is owned by the Arkansas Valley Oil Company. It was placed on exhibition for Mr. Kirk's benefit, and pumped five barrels per day. A well which has been shut down for a month or more will not produce any more oil when started than it would if it had been worked steadily. For some unexplained reason, the wells do not fill up. The oil comes from a shale rock about 1,200 feet below the surface. It is of a beautiful yellowish-green color, and about 30 gravity. Local representatives of the Standard Oil Company report that it will afford 40 per cent of illuminating and 12 per cent of lubricating oil. The question of transportation is a perplexing one to the oil operators beyond the "Father of Waters." The oil produced must be taken to Pueblo, 40 miles away, before fair freight rates can be obtained through competing lines. Cleveland parties are now building a refinery at Canon City, which will bring the oil produced here in competition with that brought across the plains. Mr. Blake, who represents the Standard at Denver, is authority for the statement that the States and Territories of Colorado, New Mexico, Montana, Wyoming, and Utah have a daily consumption of refined which is equivalent to 200 barrels of crude oil.

A Remarkable Drainage Enterprise.

Few people are probably aware of the great engineering undertaking, in which Russia has been engaged for years, of draining the Pinsk marshes. These are so extensive as to secure special designation on the ordinary map of Europe, being, we believe, the only case of the kind; and, in point of area, are very much larger than Ireland. Situated on the Russo-Polish confines, they have become famous in Russian history as a refuge for all manners of romantic characters, and have remained an irreclaimable wilderness in the midst of a prosperous corn-growing region up to within the last few years.

In 1870 the Russian Government first took in hand seriously the abolition of this wild expanse, which, owing to being perpetually more or less submerged and covered with a jungle growth of forest, prevented not only communication between the Russian districts on either side, but also between Russia and Austro-Germany. Consequently, a large staff of engineering officers and several thousand troops were draughted into the region, and these have been engaged upon the undertaking since. Up to the present time about 4,000,000 acres have been reclaimed, thanks to the construction of several thousand miles of ditches and of canals so broad as to be navigable for barges of several hundred tons burden. Just now the engineers are drawing up the programme for next year, which comprises the drainage of 350,000 acres by means of the construction of 120 miles of ditches and canals.

Of the 4,000,000 acres already reclaimed, 600,000 acres consisted of sheer bog, which has been converted into good meadow land; 900,000 acres of "forest tangle," which have been prepared for timber purposes by cutting down all the underwood and thinning the trees; 500,000 acres of good forest land—forest oases in the midst of the marshes—hitherto inaccessible, but which have been connected more or less by navigable canals, and thereby with the distant markets; and finally 2,000,000 acres have been thrown open to cultivation, although only 120,000 acres have been actually occupied up to now. Besides making the canals and ditches, the engineers have built 179 bridges, bored 152 wells from 40 feet to 80 feet deep, and 425 from 20 feet to 40 feet, and have made a survey of 20,000 square miles of country hitherto unmapped. When their task is finished, Russia will have effaced from the map of Europe one of the oldest and toughest bits of savage nature on the Continent, and a few years will suffice to render the Pinsk marshes undistinguishable from the rest of the cultivated region of the sources of the Dnieper. From an engineering, geological, and scientific point of view, generally, the work is one of special interest, and capable globe trotters, anxious for a novel theme, might do worse than spend a few months amidst the fading Pinsk marshes, describing the changes.—*Engineering.*

A NEW DOMESTIC MOTOR.

Our readers are already acquainted with the many efforts that have been made to devise a motor adapted to the requirements of the smaller industries. We have from time to time described such motors—run by steam, gas, hot air, or water—and we now propose to speak of one which is interesting from the problem that the inventor proposed to himself to solve, as well as from the means he took to solve it. The inventor,

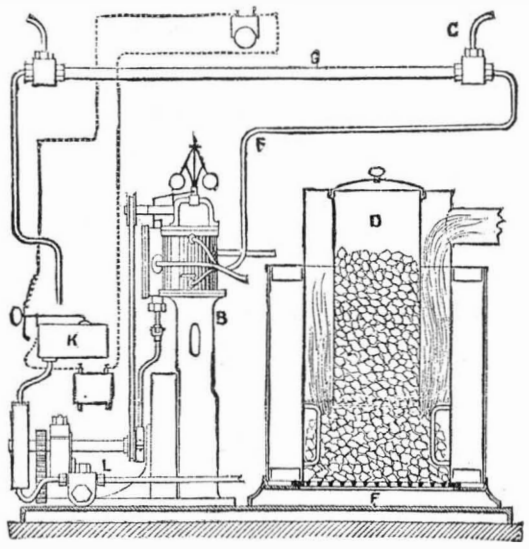

Fig. 2.—DETAILS OF THE MECHANISM.

Mr. A. Pifre, set out to construct a motor that should be capable of being used everywhere, even in the city or the village, be easy to set in motion, and keep in repair without special knowledge, and combine the simplicity of gas motors with the economy, etc., of the steam engine.

In order to solve this problem, which is one that has often attracted the attention of engineers, and is of great importance, Mr. Pifre had recourse to steam. His idea was that since the steam engine, raised to its highest power, has centralized motive power to the profit of the greatest enterprises of our epoch, it might become its province to likewise act as a domestic motor. As the chief defect of small steam engines is that they require more care and watchfulness than are demanded by large ones, M. Pifre has changed the usual mode of producing steam and converting it into work, and has devised an apparatus which is capable of running automatically for several hours without any supervision on the part of its owner. Hence the characteristic name of "Automotor" that has been bestowed upon it.

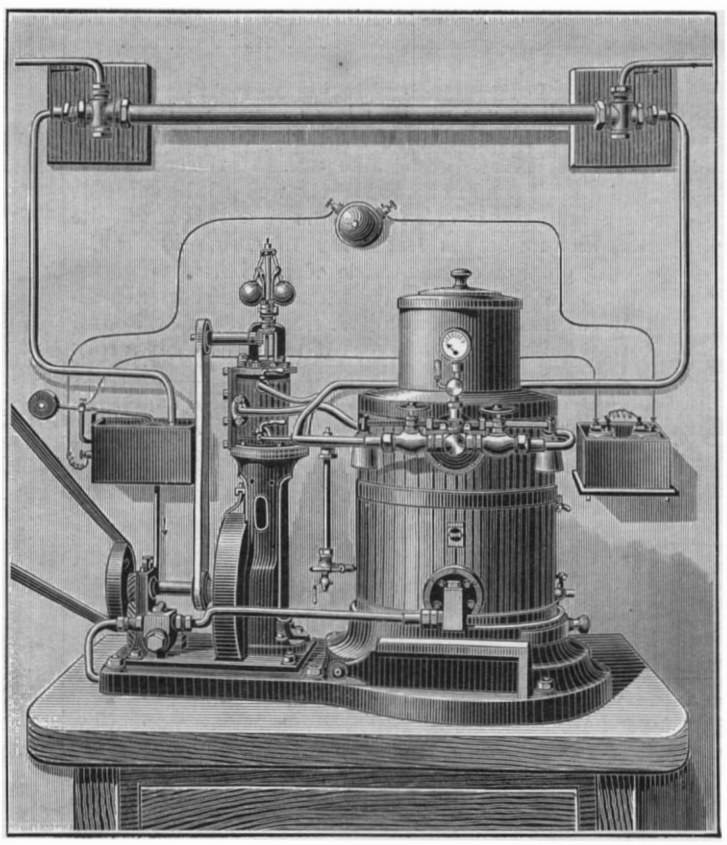

Fig. 1.—PIFRE'S DOMESTIC MOTOR.

The generator and motor are united upon the same base, and the condenser is located wherever most convenient.

The generator, A (Fig. 2), has some resemblance to a hot air stove, but one that has been changed internally in such a way as to produce an abundance of steam. The fire is lighted at the base of a central cylinder, D, which is afterward filled up to the top with fuel. The combustion proceeds upon the grate, E, at the base of the cylinder, and is absolutely constant so long as any coke remains. Fuel is put in at distant intervals to make up for what has been burned. This suffices to render the production of steam constant and regular, without any of those disturbances that take place in the usual boilers of small size. The intensity of the fire is regulated through the door of the ashbox and the damper in the chimney.

The motor, B, is of the vertical type. Its cylinder, its piston, and its valves operate without ever being lubricated with any fatty matter. As for the condenser, C, that consists of a pipe, G, that surrounds the escape pipe, F, to a certain distance, and permits of the circulation of cold water around it.

The steam produced in the generator passes into the cylinder, and, after moving the piston therein, escapes through the pipe, F, is condensed in the pipe, G, and falls in the form of water into the small reservoir, K. From this latter the distilled water is taken up by the feed pump, L, and introduced again, well aerated and free from grease, into the generator, A, whose level remains constant. This constancy in the level of the water and the automatic feeding of fuel in the furnace are characteristic traits of this new motor, the surveillance of which is thus reduced to it simplest limits.

The automotor shown in Fig. 1 is the smallest size that Mr. Pifre constructs. It is of one-quarter horse power, weighs 770 pounds, and occupies a space of but 3¼ x 2 feet. Its height is 2¼ feet. Notwithstanding its small dimensions, it is provided with all those safety apparatus that are found in large engines. The small reservoir for condensed steam is surmounted by an electric telltale, which makes itself heard whenever anything wrong occurs.

Aside from the applications already made by Mr. Pifre in various Parisian industries, one of these little motors has recently been very ingeniously applied to the running of a steam launch twenty feet in length, which it takes but one man to maneuver.—*La Nature.*

The Miller Process for Refining Gold and Silver.

Mr. G. W. Griffin, U. S. Consul, Sydney, N. S.W., says:

This process was discovered in 1868 by Mr. F. Boyer Miller, then one of the assayers to the Sydney mint and now superintendent of the bullion office in the Melbourne branch. It was introduced on a practical scale in 1869, when over 200,000 ounces were treated; since then it has been applied to the whole of the gold brought to the Sydney mint for coinage, with the exception of such small quantities as had been previously refined. The total weight operated on at the Sydney mint has amounted to more than 6,600,000 ounces (or 20 tons), and the value of the silver extracted and sold to $875,000, of which $200,000 have been paid over as revenue, and the remainder to the owners of the gold. The average assay of the refined gold, which in 1869 was 0·9931, is now 0·9965. These results have been obtained with comparatively little expense, while the introduction of the process has been in many ways of the greatest advantage to the successful working of the mint.

The chlorine process has also been in use at the Melbourne branch since its opening in 1872 and over 7,000,000 ounces of gold have been refined with the same satisfactory results.

Mr. Miller stated in his application for a patent that his invention has for its object the toughening of brittle gold bullion and the refining of alloyed gold, whether naturally or artificially alloyed, together with the separation of any silver it may contain. The operations requisite may be performed on the sole of a reverberatory or other furnace or in retorts made of some refractory material, or, as the inventor prefers, in good clay crucibles.

The crucibles are prepared by dipping them in a strong solution of borax in hot water, and subsequently drying them. In these the gold to be operated on is melted in the ordinary manner, with the addition of one-half of 1 per cent of fused borax, a well fitting cover having first been luted over the mouth of each crucible employed. In this cover are one or more holes to allow of the introduction of a tube or tubes constructed of some suitable refractory material, such as fire-clay, descending to the bottom of the crucible, and through which chlorine gas or hydrochloric acid gas is forced while the gold is still in a melted state. After the chlorine gas or hydrochloric acid gas has been thus passed through the melted gold for a sufficient time, which necessarily varies according to the quantity and quality of the gold operated on, the silver and baser metals are converted into chlorides, and rise to the surface of the refined gold. The more volatile chlorides partially escape, and the remainder is easily removed by pouring the entire contents of the crucible into the moulds and taking out the cake of chloride as soon as cold, or by allowing the gold to cool sufficiently to set or become solid, but not to become so cold as to prevent the more fusible chlorides from being poured off, to be subsequently reduced to the metallic state by any of the well known methods.

A BOILER has been constructed in France in which the metallic surface exposed to fire does not touch the water.

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CANDELABRA CACTUS AND CALIFORNIA WOODPECKER.

BY C. F. HOLDER.

One of the most picturesque objects that meet the eye of the traveler over the great plains of the southern portion of California and New Mexico is the candelabra cactus. Systematically it belongs to the Cereus family, in which the notable Night-blooming Cereus also is naturally included. In tropical or semi-tropical countries these plants thrive, and grow to enormous size. For example, the Cereus that bears those great flowers, and blooms at Night, exhaling powerful perfume, as we see them in hothouses in our cold climate, are even in the semi-tropical region of Key West, on the Florida Reef, seen to grow enormously in length.

We cultivated several species of the more interesting forms during a residence on the reef. Our brick house, two stories in height, was entirely covered on a broad gable end, the branches more than gaining the top. There is a regular monthly growth, and this is indicated by a joint between each two lengths. Should the stalk be allowed to grow without support, it will continue growing without division, and exhibit stalks five or six feet in length, when they droop, and fall upon the ground.

Where there is a convenient resting place on which it can spread out and attach itself, the stalk throws out feelers and rootlets, which fasten securely to the wall or brickwork; then, this being a normal growth, there is a separation at intervals of about a foot. That is, the stalk grows in one month about twelve inches, and if it has support the middle woody stalk continues to grow about an inch further, but has no green, succulent portion, in fact, looks like a stem; then the other monthly growth takes place, and ends with a stem, and so on indefinitely. Our house was entirely covered by the stems of such a plant, and the flowers were gorgeous in the extreme. The perfume, however, was so potent that it became a nuisance. Such is the Night-blooming Cereus in the warm climates, and similarly the Candelabra Cereus grows in stalks, but architecturally erect, fluted like columns. The flowers are large, and resemble those of the night-blooming variety. Some columns remain single, and are amazingly artificial appearing; others throw off shoots, as seen in the picture. There are some smaller varieties that have even more of a candelabra look, there being clusters of side shoots, the latter putting out from the trunk regularly, and standing up parallel to each other. The enormous size these attain is well shown in the picture.

Whenever the great stalks of these cacti die, the succulent portion is dried, and nothing is left but the woody fiber. They are hollow in places, and easily penetrated. A species of woodpecker, *Melanerpes formicivorus*, is found to have adopted the use of these dry stalks for storing the winter's stock of provisions. There are several round apertures seen on the stems in the pictures, which were pecked by this bird. This species of woodpecker is about the size of our common robin or migratory thrush, and has a bill stout and sharp. The holes are pecked for the purpose of storing away acorns or other nuts; they are just large enough to admit the fruit, while the cup or larger end remains outside. The nuts are forced in, so that it requires considerable wrenching to dislodge them. In many instances the nuts are so numerous, the stalk has the appearance of being studded with bullets. This appearance is more pronounced in cases where the dead trunk of an oak is used. There are some specimens of the latter now owned by the American Museum of Natural History, which were originally sent to the Centennial Exhibition at Philadelphia. They were placed in the department contributed by the Pacific Railroad Company, and at that time were regarded as some of the wonders of that newly explored region through which the railroad was then penetrating. Some portions of the surface of these logs are nearly entirely occupied by the holes with acorns in them. The acorns are driven in very tightly in these examples; much more so than in the cactus plants, as the oak is nearly round, and the holes were pecked in solid though dead wood. One of the most remarkable circumstances connected with this habit of the woodpecker is the length of flight required and accomplished. At Mount Pizarro, where such storehouses are found, the nearest oak trees are in the Cordilleras, thirty miles distant; thus the birds are obliged to make a journey of sixty miles to accomplish the storing of one acorn. At first it seemed strange that a bird should spend so much labor to place those bits of food, and so far away. De Saussure, a Swiss naturalist, published in the *Bibliotheque Universelle* of Geneva entertaining accounts of the Mexican Colaptes, a variety of the familiar "high hold," or golden winged woodpecker. They were seen to store acorns in the dead stalks of the maguey (*Agave Americana*). Sumichrast, who accompanied him to Central America, records the same facts. These travelers saw great numbers of the woodpeckers in a region on the slope of a range of volcanic mountains. There was little else of vegetation than the *Agave*, whose barren, dead stems were studded with acorns placed there by the woodpeckers.

The maguey throws up a stalk about fifteen feet in height yearly, which, after flowering, grows stalky and brittle, and remains an unsightly thing. The interior is pithy, but after death of the stalk the pith contracts, and leaves the greater portion of the interior hollow, as we have seen in the case of the cactus branches. How the birds found that these stalks were hollow is a problem not yet solved; but, nevertheless, they take the trouble to peck away at the hard bark, and once penetrated they commence to fill the interior; when one space is full, the bird pecks a little higher up, and so continues.

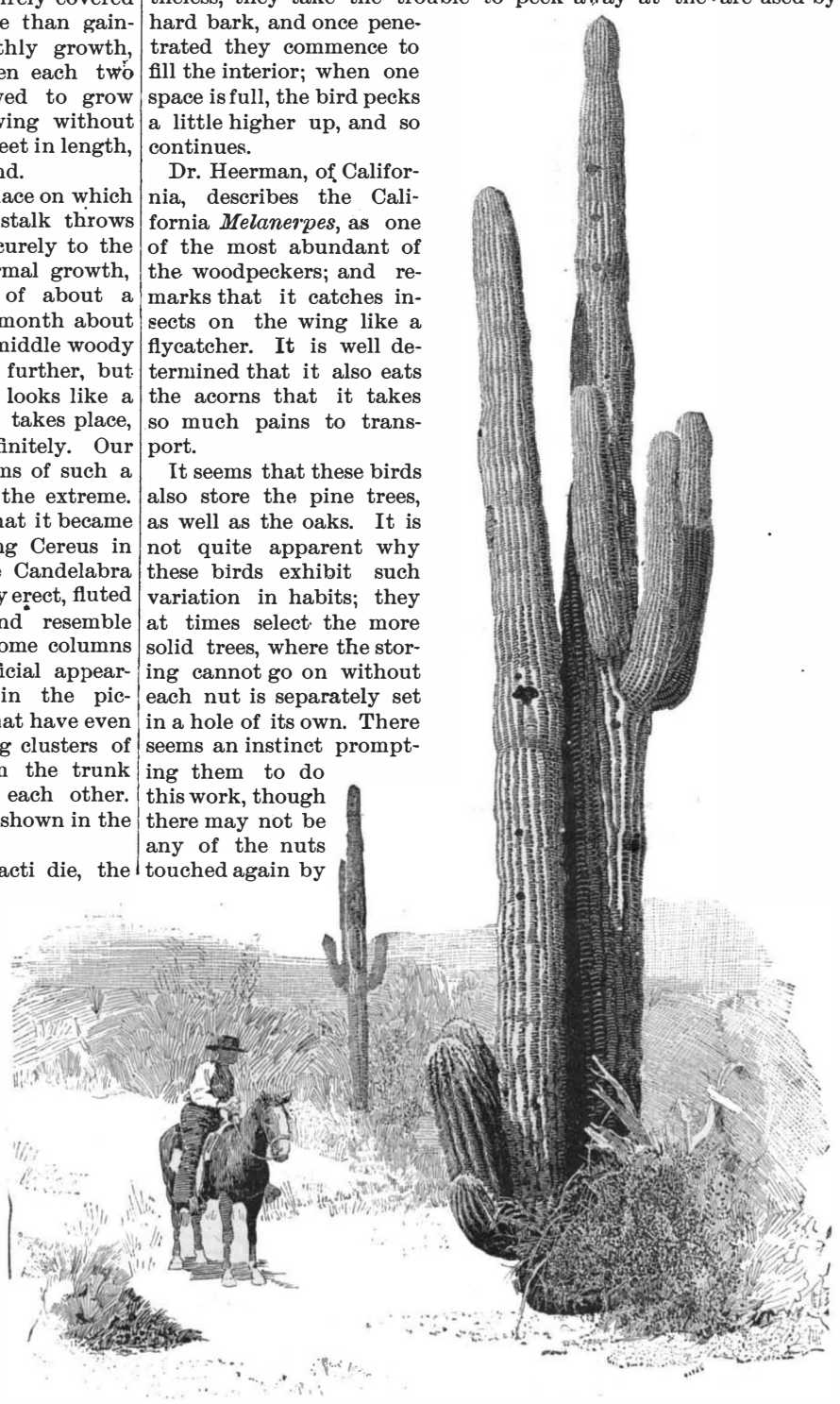
Dr. Heerman, of California, describes the California *Melanerpes*, as one of the most abundant of the woodpeckers; and remarks that it catches insects on the wing like a flycatcher. It is well determined that it also eats the acorns that it takes so much pains to transport.

It seems that these birds also store the pine trees, as well as the oaks. It is not quite apparent why these birds exhibit such variation in habits; they at times select the more solid trees, where the storing cannot go on without each nut is separately set in a hole of its own. There seems an instinct prompting them to do this work, though there may not be any of the nuts touched again by the birds. Curiously enough, there are many instances of the birds placing pebbles instead of nuts in holes they have purposely pecked for them. Serious trouble has been experienced by these pebbles suddenly coming in contact with the saw of the mill through which the tree is running. The stone having been placed in a living tree, as is often the case, its exterior had been lost to sight during growth.

Some doubt has been entertained about the purpose of the bird in storing the nuts in this manner. De Saussure tells us he has witnessed the birds eating the acorns after they had been placed in holes in trees, and expresses his conviction that the insignificant grub which is only seen in a small proportion of nuts is not the food they are in search of.

C. W. Plass, Esq., of Napa City, California, had an interesting example of the habits of the California *Melanerpes* displayed in his own house. The birds had deposited numbers of acorns in the gable end. A considerable number of shells were found dropped underneath the eaves, while some were found in place under the gable, and these were perfect, having no grubs in them.

The picture shows a very common scene in New Mexico. The columns, straight and angular, are often sixty feet in height. It is called torch cactus in some places. There are many varieties, and as many different shapes. Some lie on the ground; others, attached to trunks of trees as parasites, hang from branches like great serpents; but none is so majestic as the species called systematically *Cereus giganteus*, most appropriately. The species growing pretty abundantly on the island of Key West is called candle cactus. It reaches some ten or twelve feet, and is about three inches in diameter. The angles are not so prominent, which gives the cylinders a roundish appearance. They form a pretty, rather picturesque feature in the otherwise barren undergrowth of shrubbery and small trees. Accompanied by a few flowering cocoa palms, the view is not unpleasing. The fiber of these plants is utilized in some coarse manufactures. The maguey, or Agave, is used in the manufacture of fine roping. Manila hemp is made from a species. The species whose dried stalks are used by the woodpeckers for their winter storage was cultivated at Key West, Florida, during several years, before 1858. Extensive fields of the Agave stood unappropriated at that period. Considerable funds were dissipated on this venture. Extensive works were established, and much confidence was entertained that the scheme would prove a paying one, but the "hemp" rope which this was intended to rival could be made cheaper than this. The great Agave plants, with their long stalks, stand now, increasing every year, until a portion of the island is overrun with them.



THE CANDELABRA CACTUS.

Corrosive Sublimate as a Surgical Dressing.

While we are all familiar with the fact that the bichloride of mercury is a most valuable disinfectant, yet we doubt whether its full power is realized, and whether it holds that high place in the estimation of surgeons to which its undoubted efficacy entitles it.

Considering it as one of the most valuable aids to the surgeon, we deem that all should be familiar with its merits, and we therefore desire to call notice in an especial manner to its use. In one of our hospitals in this city, solutions, varying from 1 to 1,000 to 1 to 5,000, are kept constantly on hand, and when cases of bruised and lacerated limbs are brought in, they are at once enveloped in these solutions, and the results are truly remarkable. One case is so striking as to merit special note:

A small child was brought in with his leg so mangled (bones comminuted, etc.) that the whole surgical staff (three prominent surgeons) decided that amputation was imperative. To this the parents so strongly objected that the surgeons were forced to yield. Explaining to the parents the almost certainty that the child would die, and placing the responsibility where it rightly belonged, the limb was incased in bichloride sawdust. Presto! result, an absolutely perfect limb.

Many such cases could be cited, but suffice it to say that by the use of corrosive sublimate we can save many limbs that would otherwise be sacrificed.

In this connection, it will be well to note that Dr. R. J. Levis has great faith in the potassio-mercuric iodide. He has tablets prepared of such strength that one dissolved in a pint of water gives him a $\frac{1}{12000}$ solution, which with hydronaphthol constitutes his antiseptic armamentarium.—*Med. and Surg. Reporter.*

Progress at Sibley College, Cornell University.

A very desirable feature has been added this year to the usual roster of the engineering course. A number of well known specialists have engaged to lecture to the students, among whom Dr. R. W. Raymond, of the Institute of Mining Engineers, Dr. Leavitt, of the Mechanical Engineers, Mr. C. T. Porter, Mr. J. M. Allen, Dr. C. E. Emery, and Mr. J. C. Hoadley have been announced. These gentlemen select their own subjects, and are able to present to the students the results of active professional life.

A beautifully made longitudinal section of a Deane steam pump has been added to the College Museum. Other firms are preparing similar models.

Preserving Plants.

For the last three years, says Mr. P. Hennings, certain fruits, flowers, and other portions of plants have been preserved in perfect condition at the Berlin University (Botanical Museum), by means of a solution containing four parts of water and one part of alcohol saturated with salicylic acid.

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Correspondence.

Making Water Heat Itself.

To the Editor of the Scientific American:

In your issue of November 7, Mr. O. B. Server files "this his caveat of priority," in that he has conceived the idea that a current of water may be induced to obligingly change its velocity to heat, and thus modify the temperature of adjacent countries.

Mr. Server proposes to avoid the expense of Mr. J. C. Goodridge's proposed dam across the Straits of Belle Isle, and by the erection of a few "waterwheels and friction contrivances" to so heat the water that it will eclipse the Gulf Stream itself as a dispenser of warmth. But has not Mr. Server carried the matter a little too far in his anxiety to secure the proposed benefit to America, and yet avoid any possible cooling of the haunts of the British lion?

What if his "friction contrivances" should heat the water too much, to the boiling point perhaps, and, besides cooking all the fish in the vicinity, should give Canada and New England a tropical climate? It is well indeed that he is to "stop the wheels in summer."

Bantering aside, it is clear that Mr. Server has been reading thermodynamics; but either he has just begun it, or else he has skipped the mathematics. He informs us that he would "change its velocity to heat," but he does not say what will become of the hot water. Perhaps he thinks that it would kindly take itself out of the way without any velocity. Does he think that the numerous icebergs which Mr. Goodridge mentions are going to be scared by his "friction contrivances," so that they will steer clear of the Straits?

But these and a few other little matters we will leave for Mr. Server to figure on, and suppose his "waterwheels, friction contrivances," etc., to be all set up in working order, churning the vast stream, ten miles wide and fifty to one hundred feet deep, to a mass of foam, and that, as the water passes them, its whole velocity is transformed to heat; now, what is the energy of the current, or rather of each pound of it, moving at a velocity of two knots per hour, or less than four feet per second? By the well known formula for energy $=\frac{Wv^2}{2g}$, we have the energy of each pound of water equal to about ¼ of one foot-pound. Further, the amount of energy which, transformed to heat, will warm a pound of water one Fahrenheit degree is 772 foot-pounds. Hence, our quarter of a foot pound of energy will warm the water just $\frac{1}{3088}$ of a degree.

We can imagine Mr. Server feeling of the water on the "hot side" of his "friction contrivances," to see if it will burn his fingers! But while he is looking about for a thermometer that will register his $\frac{1}{3088}$ of a degree, we would advise people to lay in as usual their winter's supply of coal.

CHAS. W. BAKER.

University of Vermont.

The New York Pneumonia Epidemic.—A Probable Cause.

To the Editor of the Scientific American:

The article on "Pneumonia and Ozone," in your issue of Oct. 3, was read by me with considerable interest, and is suggestive of important inquiry.

The careful observations of Dr. Draper, of the Meteorological Observatory, Central Park, extending over a period of eight years, touching the contemporaneous prevalence of pneumonia and the presence of ozone in the atmosphere in excess, are worthy of note; and it would have been additionally instructive to have been able to ascertain whether the two occurred more especially in cold weather.

The majority of observers state that ozone is found more abundantly in winter than in summer. Its comparative scarcity during the summer has been accounted for by supposing that more of it is consumed in oxidizing the organic impurities of the air, which are, of course, more abundant during hot weather. Others have believed that less ozone is produced in summer in consequence of the occurrence of only one maximum of atmospheric electricity in the twenty-four hours during that period of the year.

Several observers have noticed an excess of ozone during the night. Mr. Lowe, of the Boston Observatory, also found that the excess of ozone at night over the day varies during the different seasons of the year (Brit. Assoc. Rep., 1862), and this appears, very generally, to correspond with the cold season and early spring (*vide* "Ozone and Antozone, their History and Nature," by Cornelius Fox, M.D.; I. and A. Churchill, London, 1873.)

This prevalence of pneumonia in New York would, it might be supposed, correspond largely with the continuance of cold weather, at whose door we are accustomed to lay much of evil connected with diseases of the respiratory organs.

Dr. Felix von Niemeyer, of Tubingen, in his "Text Book of Practical Medicine," remarks: "We particularly observe the epidemic occurrence of pneumonia in severe and protracted winters during the prevalence of a northeast wind; sometimes, however, it arises under conditions precisely the reverse." With regard to the influence of cold, he continues: "It is difficult to decide in individual instances whether the attack has been preceded by an exposure to cold more severe than that to which the patient has repeatedly exposed himself with impunity. Opinions, therefore, are divided as to the effect of cold in producing pneumonia."

Supposing the fatality from the disease to have occurred chiefly in the winter months, while noting the observation of the prevalence of ozone in excess, under such circumstances, I am inclined to think, with you, even if the connection between the two be not purely accidental, that they can scarcely stand in the relation of cause and effect; and especially as there does appear to me to exist a more than probable cause for the greater prevalence of pneumonia in the city of New York which has been noted recently.

In the English *Lancet* of Sept. 20, 1884, I communicated an article "On Some Probable Points in the Etiology of Pneumonia," etc., as the result of experience in private medical practice, succeeded by observation afforded during a period of service in the Public Health Department in the northwest of England, in which are detailed numerous instances of the fatal occurrence of pneumonia where there had been detected a palpable contamination of the atmosphere of the dwelling with filth emanations.

The instances there detailed are the result of but one year's observation (the last of my tenure of office, the notes being at hand), yet amply sufficient, as it appears to me, to prove unmistakably that there is more than a probable causative influence at work in the production of the disease in the manifest defilement of the air within the dwelling.

The relation of pneumonia with typhoid fever has long been observed by medical writers, and the cause of the former, which I have pointed out, would coincide with the presence of bacteria in the system, when suffering from it, without necessarily committing ourselves to a causative specific bacillus.

It might appear to savor of conceit when I state that, when I saw the communication in your columns of the 3d Oct., alluding to the great prevalence of pneumonia in New York during the present year, the circumstance at once occurred to me that, when in that city in the late spring of last year, in the company of a gentleman from Detroit, Mich., and noticing the deep sewerage works which were in process of construction, and contemplating the increased dangers caused by their junctions communication with the buildings adjacent, more particularly with their deep basements, which it would appear they were intended to sewer, I remarked to my friend that I feared these deeper sewerage works would not prove an unqualified benefit, and we might expect to hear of the prevalence of such diseases as pneumonia; and on my return home I mentioned the same thing to my family, touching the danger to the health of the inhabitants of the Empire City.

The problem of efficient sewerage is as yet unsolved, more especially with reference to the thorough cleansing and ventilation of the sewers; and where deep sections from the mains are brought within the very walls of our dwellings, efficient ventilation being then so difficult, the pernicious gases therefrom have a tendency to diffuse themselves through the building, attracted by the lighter, warmer air within, in spite of concrete, water trapping, and other precautions.

If the basements of the large structures in the city, now being erected, must be drained into the sewers, it would seem imperative to devise some means of diverting the gases from diffusion within, such as by raising the temperature of the air of the ventilating shafts to a higher degree than that of the air inside the building, and carefully maintaining its excess; while the thorough and systematic flushing and disinfection of the main sewers, and of the branches to individual properties, where greasy house waste or other deposit adheres so tenaciously, becomes all the more imperatively necessary. Where practicable, all house waste pipes should discharge into exposed outside channels, and the sewer sectional inlets should be several feet distant from the foundation walls.

Where sewers are, of necessity, in near contiguity, the advisability of providing a stratum of impervious, moist clay or stiff soil around the foundation exteriorly, for some feet in width, so as to preserve the ground air of the foundation free from defilement, will be apparent.

The drainage of water closets presents difficulties requiring special precautions, the object being to isolate their position as far as possible from the house atmosphere. This has been more or less attempted by placing the soil fall pipe external to the building, and freely ventilating its base and apex, taking care that no filth containers are permitted in the structural arrangements, and securing ample flushing provisions. The higher up in the building the water closets are placed, the better it would appear for securing the purity of the indoor air of the rooms on the lower stories, provided it be free from other sources of sewer defilement.

But with cellar drains, communicating with the sewers, the difficulty of securing this first essential of physical health is greatly increased, and the danger to the inhabitants correspondingly augmented; the problem is, confessedly, a difficult one to solve, if indeed it be capable of satisfactory solution, and we find the assurances of so-called experts balk us in the repeated inroads of deadly disease.

While yielding to the demands of so-called civilization, we are in danger of renouncing the first principles of health.

By multiplying conveniences for the disposal of house waste, by means of communication with the sewers, all alive with their pestilential *contagium*, we are inviting deadly disease to enter our dwellings; and by perpetuating systems which rob the soil of its due quota of waste material, for transformation and reconstruction, we are alike impoverishing our exchequer and encompassing too readily our own destruction.

JOHN WARD, M.D.

Sutton, Birmingham, England, Oct. 22, 1885.

The Telephone Question.

To the Editor of the Scientific American:

I trust you will permit a brief summary in your columns of facts on the other side of the telephone question. They are as follows:

1. Reis telephones, when used *as described by him*, will not transmit speech.

2. He who invents a new *art* is entitled to the fame and financial success based upon a patent for such an art.

3. If the assertions that Reis *did* occasionally understand spoken words be true, that did not constitute the art of speaking, because an art is something that can be *controlled*, and Reis then only spoke because the action of his transmitter occasionally was *beyond* his control.

4. Five years before Reis made his instruments, their principle was *fully published in a prominent scientific paper in the city where he then lived, under the name "telephony," and he was then an active member of the physical society of that place.* Those principles were first accurately expounded by Charles Bourseul, of whom said publication spoke.

5. The method of producing undulations by immersing an electrode in liquid, which is the subject of Mr. Gray's caveat, was described in Mr. Bell's original application, which was sworn to several weeks before Mr. Gray's caveat was *written*. Hence, it is absurd to assert that Mr. Bell obtained that idea from Mr. Gray's caveat.

6. That we can *now* speak with the Reis instruments is no more proof in favor of Reis than the fact that we can also *now* speak with a Morse key and sounder is a proof that Morse invented the art of speaking by electricity. Both, together with other electrical instruments, can to-day be manipulated on Bell's principles so as to transmit and receive speech.

E. BERLINER.

Washington, D. C., November 27, 1885.

The statement made by our correspondent in his fifth paragraph, we believe, is now for the first time brought out, and is of especial interest in view of the testimony of Professor Gray.—EDS.

The Preservation of Ropes.

The preservation of scaffold ropes is a matter of great practical importance when scaffolding remains erected for any considerable time, especially in localities where the atmosphere is destructive of hemp fiber. It has been suggested that in these cases the ropes should be dipped, when dry, into a bath containing 20 grammes of sulphate of copper per liter of water, and kept in soak in this solution for four days, afterward being dried. The ropes will thus have absorbed a certain quantity of sulphate of copper, which will preserve them from the attacks of animal parasites and from rot. The copper salt may be fixed in the fiber by a coating of tar or by soapy water. For tarring the rope it is best to pass it through a bath of boiled tar, hot, drawing it through a thimble to press back the excess of tar, and suspending it afterward on a staging to dry and harden. In the second method, the rope is soaked in a solution of 100 grammes of soap per liter of water. The copper soap thus formed in the fiber of the rope preserves it from rot even better than the tar, which acts mechanically to imprison the sulphate of copper, which is the real preservative. It is not stated whether the copper treatment is equally serviceable with dressed as with plain hemp ropes.

Borax as an Internal Disinfectant.

In the *Union Medicale*, Dr. Cyon confirms the statement, made by Dumas in 1878, that borax is possessed of most valuable antiseptic powers. Independently of its value for the preservation of food, it is a great preventive of infectious diseases, and may be employed internally to ward off epidemics. It may be taken for months or years with impunity, and constitutes a valuable prophylactic. Dr. Cyon states that it is a remarkable fact that in all epidemics of cholera the workmen in boracic acid factories have always escaped the disease. The usual dose is five or six grammes (75 to 90 grains) daily, taken for an indefinite time.

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ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. William H. Knight, of Portland, Oregon. Combined with a drawhead is a crossbar therein and a rod projecting upward therefrom, a spring acting on the rod, while there are levers for moving the rod and crossbar upward.

A grip for cable railroads has been patented by Mr. David Stout, of Logan City, Arizona Ter. Its construction is such that when the cable is grasped it will carry an endless chain of shoes with it, so that the friction will be between the shoes and blocks connected with bars bolted to the frame of the car, and the cable will be protected from wear.

A chart for railroad rolling stock has been patented by Mr. Joseph S. Graham, of Buffalo, N. Y. It has apertures arranged in vertical and horizontal rows, numbers being produced at the left of the horizontal rows, and two numbers, one above the other, above each vertical row, the chart to show the condition of the rolling stock in relation to repairs.

A rock drilling machine has been patented by Mr. William H. Clark, of What Cheer, Iowa. Combined with a tube for holding the drilling bit is a bevel gearing for revolving the tube, and a fixed screw held in a frame and passed through a nut on the end of the tube, whereby the bit is moved forward automatically.

A hydraulic motor has been patented by Mr. Christoph G. Wurster, of Hudson, N. Y. This invention consists of two cylinders with pistons, two cylindrical valve chambers with slide valves of special construction, with inlet and outlet ports, an exhaust chamber, and connections for transmitting the motion to a common shaft, making a motor intended to give high speed with a simple construction.

A distance instrument for surveyors' use has been patented by Mr. Jefferson L. Buford, of Albany, Texas. It has a novel arrangement of horizontal graduated ring, with a telescope made adjustable about a vertical axis, with other special features, to permit the distance from a given spot to a remote point to be quickly determined, and dispense with the traverse table, table of logarithms, and chain carrying.

A car axle box has been patented by Mr. William C. Miller, of Parsons, Kan. It has such an arrangement of the waste cellars that the oil cannot drip to the bottom of the cotton and be lost, but will flow on and lubricate the spindle, while the box has such vertical division that when a brass becomes heated and swells, the sections can be quickly separated for the removal of the heated parts.

A combined air exhauster and water elevator has been patented by Mr. Thomas Arthur, of Bangor, Pa. It is made with a conical tube inserted in a water pipe, and connected by an air pipe with the upper part of the short arm of an elevator, the lower end of the arm having a water seal, and the upper end of the long arm being extended down past the end of the air pipe, its lower part having an air inlet, the device being adapted for withdrawing water and air from mines.

AGRICULTURAL INVENTIONS.

A combined cultivator and land marker has been patented by Mr. B. Frank Birkett, of Burlington, N. J. This invention covers a novel construction and combination of parts in a machine to make it readily adjustable for either of the two uses, or it can be adjusted so that will throw the soil toward or from the plants as desired.

MISCELLANEOUS INVENTIONS.

A washboard has been patented by Mr. Isaac Hussey, of Columbus, O. It has ribs or beads formed on its surface, between which are grooves carrying brushes or tufts held in place by wires secured in grooves in the back of the board.

A bed pan has been patented by Sarah V. Beal, of Ann Arbor, Mich. It has a double bottom, with a discharge pipe on a level with the true bottom, having branch pipes projecting laterally, to discharge the contents of the pan at either side of the bed through a connecting flexible tube.

A lighting device has been patented by Mr. Nathan B. Stubblefield, of Murray, Ky. It consists of a tapering tube with removable handle, a wick, and a sheath fitting the tube, making a convenient device for lighting lamps with glass chimneys without removing the chimneys.

A horse collar has been patented by Mr. Martin F. Sauer, of Somonauk, Ill. The collar is stuffed in the usual manner, but has a peculiar neck formation to render it flexible and so it will not bear on the throat or breast of the animal, while it is intended to outwear the ordinary form of collar.

A lock for sliding doors has been patented by Messrs. Miles Hayden and William C. Dixon, of Gay Hill, Texas. It is specially intended for use on freight cars, where great durability and safety are required, and contains novel features calculated to render it free from liability to damage by collisions, while it can be quickly and readily operated.

A vegetable cutter has been patented by Mr. Alfred Cannon, of High Spire, Pa. It has a cutter operating across the open forward end of a feed box, in front of a feed board, making a machine suitable for use in manufacturing establishments, restaurants, and families, or which can be used for cutting vegetables for stock on farms.

A bicycle holder has been patented by Mr. Albert P. Seiler, of Mansfield, Ohio. Combined with a base are rollers and upwardly projecting frames to hold a bicycle in such manner that the rider can operate it as if on the road, and exercise himself in such way as to increase his speed or to strengthen his muscles.

A carpet sweeper has been patented by Mr. George W. Kelley, of Goshen, Ind. Combined with a box and brush roller journaled therein is a friction roller and various novel devices for adjusting the brush to project a greater or less distance from the bottom of the box, and so the carpet sweeper will be rendered more effective and durable.

A window seat box has been patented by Mr. William H. Wetherill, of Philadelphia, Pa. It is so contrived that the box and lid form a double seat, which may be occupied by two persons in different sitting positions, without twisting or straining the body, the box also forming a covered receptacle for keeping various articles.

A bracket arm has been patented by Mr. Carl Hollweg, of Barmen, Germany. It is formed of a series of links pivoted to each other, acted upon by springs between them, and locked in line by suitable latches, the arms being made in such manner that they can be extended or shortened very easily, and have an elegant appearance.

A clothes line holder has been patented by Mr. Josiah S. Wailes, of Florence, Kan. This invention covers an endless clothes line, two sets of pulleys for supporting the same, with a post or support having a laterally projecting arm carrying a pulley and placed intermediately on but one line, with other novel features for conveniently operating a clothes line.

An irrigating attachment for bottles has been patented by Mr. Anaximander B. Tutton, of Sioux Falls, Dakota Ter. It is for applying medicinal solutions or other liquids directly to mucous canals of the body, and is so made as to be attached to any bottle or vial containing the fluid to be injected, also acting to keep the bottle otherwise closed as with a cork.

A syringe for hypodermic injections has been patented by Mr. Ferdinand A. Reichardt, of Elizabeth, N. J. It is transparent, with lines of graduation and figures, with an outer casing through which the graduating lines and figures may be seen, the device being intended to guard against errors in measurement in administering medicines in this manner.

An incubator has been patented by Mr. Charles S. Newsom, of Gallipolis, Ohio. Its construction is simple, and such that a lighted lamp heats water to make an even temperature of the required warmth, while the eggs can be easily removed, turned, or changed, while the whole apparatus is very compact and takes up but little space.

A combined gate roller and hinge has been patented by Mr. Edwin C. Washburn, of Nevada, Mo. The hinge and plates forming the body of the device are of wrought iron, and the construction is such that a gate thus hung can be rolled back in the usual manner or swung on the hinge, making a firm support for a gate designed for farm use.

A bamboo fishing rod has been patented by Mr. Eugene M. Edwards, of Hancock, N. Y. It is made of compound strips or splints, glued together on their unenameled sides or faces, thus giving greatly increased strength, the rod being built up of such compound splints, and this method especially strengthening the rod near the small end.

A fish hook has been patented by Mr. Cornelius Lie, of Trondhjem, Norway. In the body of an artificial fish is a longitudinally sliding bar with hooks pivoted thereto, and slots engaging a fixed part, so that the points of the hooks will be projected from the artificial fish when the bar is moved by tension on the line to which it is attached.

A machine for making barbed fence strips has been patented by Mr. Jacob W. Roop, of Harrisburg, Pa. It has rolls for cutting out the barbs and ornamental alarm fins, and for bending up and down alternately the barbs and corrugating the strips, with rolls for forming the blank strips from a bar of steel or other suitable metal.

A bow facing oar and oar lock has been patented by Mr. Jacob L. Kwarel, of New York city. Cogged sections are employed, with the oar fulcrumed upon a coupling plate, but the construction of the latter is such that the oar will hang low in the oar lock, to give the user better control of the oar and more purchase.

A chicken brooder has been patented by Mr. Maurice H. Strong, of Cincinnati, O. It is for raising chickens hatched by an incubator or by hens, and contains a variety of novel combinations of parts, whereby the brooder can be thoroughly ventilated and adjusted to any desired height according to the height of the chicks.

A poultry water can has been patented by the same inventor. It is so constructed that the fowls cannot soil the water by stepping into it or scratching dirt into it, and it may be used as a fountain to supply water to the trough as rapidly as required, a neck on the can and flange in the cup having apertures through which the water can pass from the can into a circular or annular trough formed in the cup.

A door strip has been patented by Mr. William Clark, of Lincoln, Neb. It is held vertically movable on the bottom of the door, and has at its top two spring arms, one of which is held by a staple to the free edge of the door, so the strip will automatically close the space between the bottom edge of the door and the top of the sill, and will be raised when the door is opened.

A store service apparatus forms the subject of two patents issued to Mr. Louis G. Bostedo, of Atlantic, Iowa. This invention relates to apparatus in which overhead tracks, switches, and cars are used to transfer goods and money between salesmen's counters and the wrapping places, and provides certain novel features whereby many cars can be used, and the system can be run automatically.

An automatic stock water tank has been patented by Mr. Richard H. Barber, of Galena Kan. The body of the tank is divided vertically for the greater part of its height by partitions, forming receivers or troughs for horses and cattle, and a reservoir, the construction being such that different stock may be watered at different points, and so the quantity of water may be gauged as desired.

A wrench has been patented by Mr. Samuel J. Lea, of Chattanooga, Tenn. It construction is such as to readily adapt the jaws of the wrench to stand at any desired angle relatively to the handle, for use in turning set screws between the arms of pulleys and in places difficult of access, while it can be quickly set for different sizes of nuts or pipe, and readily changed from a pipe wrench to a nut wrench.

A thread guide and tension regulator for loom shuttles has been patented by Mr. George Baldwin, of Willimantic, Conn. Combined with the shuttle body is a bent strip having an aperture at one end and a slot at the other, with a screw and forked plate held on the strip, the thread from the spindle passing between the prongs, and the plate being adjustable to increase or diminish the tension.

A harness pad press has been patented by Mr. Joseph W. Johnson, of Lathrop, Mo. It has a base plate, side plates with lateral slotted lugs, bolts for adjustably securing such plates, form bars pivoted between the side plates and clinch bars pivoted at one end between the form bars, with other novel features, whereby the stretch can be taken out of the leather, and the pad can be stuffed while in the press.

A grain bag filler, weigher, and register has been patented by Mr. Lewis P. Summers, of Peculiar, Mo. The grain to be bagged and weighed is, by this construction, carried up a tube and discharged into a hopper, by means of a suction blast made by a fan, the hopper having two discharge tubes pendent vertically from its bottom, and always filled with grain during the operation of the machine, but discharging alternately.

A scoop balance attachment for weighing scales has been patented by Mr. Asa Leas, of West Manchester, Ohio. This invention covers a double looped balancing weight so suspended as alternately to balance the scale by an upper and lower notch, and is intended to operate automatically, so that articles may be weighed in the scoop or on the platform without balancing the scale by adding or removing weights.

A clothes drier has been patented by Mr. Leonard A. Johnson, of Candor, N. Y. Combined with a frame having slats secured on its front are arms pivoted therein and adapted to swing through slots between the slats, with locking bars for holding the arms when they are swung out through the slots, making a device which is strong and durable, and which can be folded very compactly.

An umbrella and parasol frame has been patented by Mr. William P. Conner, of Bloomsburg, Pa. The ribs and braces are arranged in pairs, the braces of each pair and ribs of each pair being connected at the hinged or pivoted ends, and the ends of the braces of each pair being pivoted to adjacent ribs of two different pairs of ribs, making a stiff frame, but one which also has considerable spring.

A fishing reel has been patented by Mr. Julius Vom Hofe, of Brooklyn, N. Y. This invention covers a novel construction of the head of the frame of the reel, which is made of a hard rubber or other like flange or disk recessed to receive the gearing, and a metal outer plate to form bearings or sockets for the spindles, there being also a peculiar attachment of the click, which is made capable of different adjustments.

A spring seat for vehicles is the subject of two patents issued to Mr. Charles Van Horn, of Bethlehem, Pa. It is so constructed that a part of the springs may be detached from the lower board, according to the weight or number of persons to ride, and the seat will always have a level up and down movement, and ride equally easy with a light or with a heavy weight, without endwise or lateral pitch.

A hide fleshing machine has been patented by Mr. Archibald W. Reid, of Ballston Spa, N.Y. According to this invention, an endless belt carrying knives suitable for fleshing is made to revolve on bearings, so the knives will be carried above an inclined table taking the place of a flesher's beam, the latter being brought near enough to the knives for them to work upon the hides by means of a treadle.

A heat regulating mechanism for incubators has been patented by Mr. Jason L. Cousins, of Kane, Pa. The box for receiving the egg trays is surrounded by an air space, and on its side is a boiler, with gas or oil burner, with which a flue and valve are connected, the valve forming an armature connected with an electro-magnet, battery, and thermostat, the apparatus covering several novel features of construction and operation.

A washing machine has been patented by Mr. George L. Ferris, of Mexico, Mo. It has a circular drum pivoted to revolve in a box or tub with a cover, the drum being revolved by a crank handle, and having on its inner surface a series of ribs or troughs, the ribs being hollow and wedge-shaped, and in operation intended to carry up the clothes and water at the sides of the drum and let them drop in the middle again.

A hydrocarbon burner has been patented by Mr. Joseph Marion, of Brooklyn, N. Y. Combined with a shallow receiver having air passages is a water box fitted to its bottom, and having corresponding passages, the arrangement being such that combustion will take place at the surface of the oil, the air supply will be previously highly heated, and small steam jets be made to unite with the flame to increase its efficiency.

A paint mixer has been patented by Mr. Frederick Brandenberger, deceased (Frederika Brandenberger, executrix), of Danville, Ill. It is more especially designed for stirring mixed paint in a storage vessel prior to drawing, such vessel being provided with a crank operated shaft and blades which lift the liquid paint from the bottom and cause it to rise in whirling currents toward the center and top, thoroughly mixing the contents of the vessel.

A mole ditching, tile forming, and wire laying machine has been patented by Mr. Samuel Montgomery, of West Toledo, Ohio. This invention covers a novel construction and combination of parts in a machine for forming a continuous cement tile or lining to a mole ditch, and also for laying telegraph or telephone wires either directly within the mole ditch or within the cement tile formed therein, and so the tile may be used as a drainage tube.

A gate has been patented by Mr. Joshua D. Fox, of Frankfort, Ind. It is a little longer at the bottom than at the top, to give the rear end bar a forward inclination, and the lower part of the rear end bar is connected with the hinge post in the ordinary way, while to the upper end of the rear end bar is attached a pivot which works in a horizontal pulley, with other novel features, making a gate which can be readily opened and closed by persons in vehicles or on horseback.

Special.

A TREASURER'S SAFETY.

An Active Screw Manufacturer has the Twists taken out of his System.

Once upon a time—and it was not so many years ago, either—gimlet-pointed screws, such as we have to-day, were unknown. The screws of those days were finished off flat at the end, and a hole had to be bored for each screw, so as to permit it to enter the wood. Some of the best inventions the world has known were by lazy fellows; and the gimlet screw was one of them. A mechanic who was "born tired," and who hated the labor of boring a hole in the wood for each screw, conceived the thought that if the screw were furnished with a little tail end in the shape of a pointed gimlet, much trouble might be saved.

At first the manufacture of such screws was attended with difficulties, but machinery to overcome these was in due time invented.

The gimlet-pointed screw is one of the necessities of the present age. Our great screw factories turn these useful little things out by the million and million. One of the greatest of the screw concerns is the American Screw Company, whose extensive works are at Providence, Rhode Island.

The treasurer of this great corporation, and one of its most active managers, is W. H. Henderson, Esq., one of the most widely known business men of Providence. Mr. Henderson, who is now well advanced in years, has had a long experience of invalidism, against which he bravely battled. His principal trouble was catarrh, which was so obstinate as for a long time to defy all treatment, and so deeply seated as to cause a great degree of deafness.

Our Rhode Island correspondent recently spent an hour with Mr. Henderson, who talked freely of his past and present experience. "My catarrh was of very long standing," said Mr. H. "At an early age I had a severe attack of scarlet fever, which left me with a variety of ailments. The most troublesome and permanent of these was this catarrh. The catarrh took a very strong hold on me, and in spite of all that the doctors could do for me it increased from year to year to such an extent that my expectorations were so copious as to be very annoying. You may judge how they were when I tell you that I would often use up as many as half a dozen handkerchiefs a day. In the night time the catarrhal discharge was so great that I almost feared to go to sleep lest I should be choked while asleep. I would have to rise once or twice during the night and free my nostrils and mouth from the accumulations. I am now over the worst of my trouble, however, and my catarrh is so nearly gone that it gives me no inconvenience. One handkerchief a day is sufficient for all my needs in that direction."

"Then, Mr. Henderson, some of the treatment you have been taking has done you good?"

"Yes; let me tell you about it. I tried a great many things, which were of no avail. One medicine after another failed me. I tried electricity, and thought I received some advantage from it; but the relief proved only partial and temporary. I was ready to try almost anything that gave any hope of relief. Mr. Sullivan Fenner, of this city, advised me to try Compound Oxygen, an article of which I knew nothing except what he told me. It had been of great advantage to him and his son. This gave me practical and lasting relief. It was about two and a half years ago that I sent to Philadelphia for a 'Home Treatment' of the Compound Oxygen, and at once began using it. You may judge of my surprise at its operation, when I tell you that in a few days I felt it was doing me good, in checking the discharges and giving new life to the affected parts. I used the Oxygen regularly and persistently for several months. At first I could inhale only a few seconds at a time, and that was with considerable difficulty. But as I continued the use of the inhalant, inhalation became easier, and relief was greater. The gain in my strength and general health was very satisfactory. I had been so much of an invalid that I was unable to attend to my business with regularity; but as my improvement in health went on, gradually but surely, I found myself able to do far more than I had done for years. To indicate to you the extent of my improvement, I may say that I now rise early, and am at my office by nine or ten o'clock. I have nine clerks and keep them busy. I go out during the day and attend to a great deal of out-door business, down town. About six o'clock I go home, and spend the evening in reading or otherwise, and go to bed about eleven. I sleep well."

"Then you are entirely free from catarrh, Mr. Henderson?"

"Quite as free as a man of my age can ever expect to be after such a protracted siege with so obstinate a disease. For all practical purposes I am a well man. I still take Compound Oxygen occasionally, especially if I take cold, for there is nothing like it to break up a cold. I have visited Messrs. Starkey & Palen, in Philadelphia, and have talked with them over my case. They are gentlemen for whom I have a high esteem, and I am glad they have done so much good and relieved so much distress as they have with the Compound Oxygen."

"Some of your friends have had pleasant experience with Compound Oxygen, have they not, Mr. Henderson?"

"Yes; I have recommended it to many. My wife has taken it with good effect. She was suffering with general debility. It vitalized her and gave her strength as nothing else did.

"Then there is an old gentleman, the father of one of my clerks, Mr. Tyler. This gentleman is over seventy years of age. For many years he had suffered from asthma. For twenty-five years he had not been able to sleep except when sitting in a chair. He could not lie upon his back. He wrote to Messrs. Starkey & Palen for a 'Home Treatment' in May, and by July he was able to lie on his back and sleep like other people.

"I think it is asking a great deal of Compound Oxygen to expect it to afford relief in such old and obstinate cases as these. But you see what it has done. It can be depended upon. I firmly believe in its efficacy."

The number of those who are firm believers in the remedial power of Compound Oxygen is daily and largely on the increase. It is a wonderful remedy for the relief of the suffering and the strengthening of the weak.

An interesting treatise on the subject is published by Messrs. STARKEY & PALEN, 1529 Arch Street, Philadelphia. **This will be sent by mail, free of charge, to all who apply for it.**

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Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Air Compressors, Rock Drills. J. Clayton, 43 Dey st., N. Y.

Haswell's Engineer's Pocket-Book. By Charles H. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Masonry, Steam Vessels, Mills, Limes, Mortars, Cements, etc. 900 pages, leather, pocket-book form, $4.00. For sale by Munn & Co., 361 Broadway, New York.

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If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions, address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

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Curtis Pressure Regulator and Steam Trap. See p. 350.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

Best Automatic Planer Knife Grinders. Pat. Face Plate Chuck Jaws. Am. Twist Drill Co., Meredith, N. H.

We are sole manufacturers of the Fibrous Asbestos Removable Pipe and Boiler Coverings. We make pure asbestos goods of all kinds. The Chalmers-Spence Co., 419 East 8th Street, New York.

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The "Improved Greene Engine" can be obtained only from the *sole builders*, Providence Steam Engine Co., R. I.

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You are allowed *a free trial of thirty days* of the use of Dr. Dye's Celebrated Voltaic Belt with Electric Suspensory Appliances, for the speedy relief and permanent cure of Nervous Debility, loss of Vitality and Manhood, and all kindred troubles. Also for many other diseases. Complete restoration to health, vigor, and manhood guaranteed. No risk is incurred. Illustrated pamphlet, with full information, terms, etc., mailed free by addressing

Voltaic Belt Co.,
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Manufacture of Soaps, Candles, Lubricants, and Glycerine. Illustrated. Price, $4.00. E. & F. N. Spon, New York.

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Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest, cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) P. Z. E.—You will find full instructions for electroplating in SUPPLEMENT, No. 310.

(2) H.—Car wheels fixed on their axles slip in going around curves.

(3) U. O. C. asks: In which number of the SCIENTIFIC AMERICAN are the directions for making an induction coil for electrically lighting gas? A. For information on induction coils consult SUPPLEMENT, No. 160.

(4) R. H. asks how to stick celluloid to basswood, as in the manufacture of organ and piano keys.

A. Use the following cement:

Gum shellac	1 ounce.
Camphor	1 "
Alcohol	4 "

Dissolve and filter; or:

Celluloid scraps	1 "
Alcohol	2 "

Macerate the scraps finely divided in the alcohol, and when they are dissolved filter.

(5) J. S. B. asks: What is the correct proportion of gas and air to form the explosive mixture in a gas engine? A. It varies in different engines. In a compression engine, it is one of gas to ten or twelve of air; in non-compression engines, one of gas to seven to ten of air.

(6) A. N. R. asks how to construct a cheap serviceable telephone to transmit sound a distance of 40 rods, if possible, without the use of electricity. A. Two cigar boxes about six inches square connected by a stout cord or, better still, by means of a twisted wire cable will probably answer your purpose.

(7) F. A. T. desires a recipe for polishing shirt bosoms, collars, and cuffs, that will put a gloss finish on them. A. Pour a pint of boiling water upon two ounces of gum arabic; cover it, and let it stand over night. Use a small quantity in the starch.

(8) W. H. B. asks how to polish, clarify, and color ox horns. A. The process is elaborately explained in Spons' Workshop Receipts, First Series. Several columns are there devoted to this subject. The book can be procured from us for $2.00.

(9) F. O. writes: I wish to filter a quantity of bay rum; could you tell me of a cheap way to manage it? A. Filter it through common filtering paper in a glass or porcelain funnel.

(10) W. F. H.—Kerosene can be vaporized by gentle heat. Gasoline is one of the lightest distillates of crude petroleum.

(11) H. E. C. asks if a diamond can be dissolved in vinegar. A. No.

(12) F. L. B. asks: Can you give me directions how to make a cheap anemometer that will give fair results as to accuracy in respect to wind pressure or velocity? Something that an ingenious, handy mechanic can make. A. Make a disk of wood having one square foot area; attach to the center of the disk a rod; place the rod in suitable horizontal guides, and put a spring back of the disk. By means of a spring balance graduate the rod into pounds and fractions of pounds. Support the disk on a pivot, and provide a vane which will hold the disk to the wind. The pressure of the wind upon the disk will then be indicated in pounds and ounces, and from this indication you can readily compute the velocity of the wind. Should you desire to do so, you can apply to the rod an index, and provide a curved scale along which the index may move, thus rendering the divisions of the scale greater, and permitting of seeing the indications at a greater distance. You can also readily make an anemometer by connecting suitable registering mechanism with a small carefully made windmill. The graduations of your indicating mechanism must be arrived at by experiment.

(13) M. D. L. M. asks what sulphurous oxide is. A. It is the product of the combustion of sulphur in dry air or oxygen gas.

(14) C. W. F. asks: In what can rubber be dissolved so that a thick or thin varnish can be made to cover rubber cloth? A. Rubber may be dissolved in naphtha, also in bisulphide of carbon.

(15) E. T.—Any wholesale drug house can furnish you with bichromate of ammonia. It can be made by evaporating a mixture of chromic acid with excess of ammonia, or by decomposing the chromate of barium with sulphate of ammonium.

(16) M. asks a good cure for mange in a dog, rather a light case. A. An ointment consisting of 1 ounce sublimed sulphur and 2 ounces lard, mixed together, is generally used for light cases.

(17) J. H. D. asks (1) the quickest way to make vinegar from cider. A. The manufacture of vinegar consists simply in exposure to the air, thereby causing an oxidation of the cider, at a temperature of from 75° to 85° Fah., in open vats or by trickling over wood. 2. Can vinegar be made quicker from cider water? A. Yes; but the article made from pomace is not marketable, on account of its flavor.

(18) A correspondent writes: Where can the seed of pure Havana tobacco be procured? A. Send to some of the large seedhouses in New York, and they will send to Cuba, and obtain the seed for you. 2. Desires information on the curing of the leaf. A. F. W. Coon, Edgerton, Wis., has recently published a book on this subject, and there is also a book on "Tobacco Culture" published in this city, which we can procure for you.

(19) V. D. & Co. ask: At what point in the discharge of a rifle does the recoil occur—when the ball first starts, or as it leaves the muzzle of the gun? A. When the ball starts.

(20) W. H. A. writes: I have two good magic lanterns, and have very little use for more than one; is there any possible way of using the lenses or combination of the lenses for a photograph camera? The condensers are 3½ inches diameter, the focusing lenses 1½ inches. A. Your lantern objective if of good quality may be used to advantage in photography. The condensers would not be available.

(21) F. J. G. asks: 1. Can you inform me how to make small "electric influence machine," partly described in SCIENTIFIC AMERICAN, March 7, 1885, page 150? A. You will find the Holtz electrical machines described in SUPPLEMENT, Nos. 278, 279, and 282.

(22) J. R. F. asks: 1. Can you tell me where the reels made on the lazy tongs principle can be bought? A. We believe that the reels referred to can be bought at most of the stores dealing in worsteds. 2. If they cannot be bought, will it be safe to make some of the same kind? A. If the reels referred to are made by the inventor or under his sanction, and there is nothing upon any of the reels or the packages that contain them to indicate that they have been patented, you cannot be prosecuted for making the reels.

(23) H. W. B.—When the Bell magneto-telephone is employed for both transmitting and receiving, it is simply inserted in the line. You may use two such instruments at each end of your line, employing one as a transmitter and the other as a receiver.—A patented article may be made and used for experimental purposes.

(24) D. J. A. asks: Will you please inform me how I can prepare plaster of Paris so that it will not crack or chip, without adding greatly to its cost? A. You can harden plaster casts by soaking them in glue size, afterward allowing the casts to dry perfectly.

(25) J. G. writes: A bets B that there is no one-wheeled vehicle in existence operated similar to a tricycle or bicycle. B claims that there is, and says that the unicycle on page 150, vol. l., SCIENTIFIC AMERICAN, proves it. A. The vehicle mentioned in our paper is a unicycle. The best bicycle riders can and do also ride on only one wheel of a machine.

(26) W. H. asks how to make colors adhere on albumenized photographs. A. Make a solution of albumen as follows: Separate from the germs the whites of eight eggs, these should amount to 8 fluid ounces of albumen. Add to this quantity 24 drops of glacial acetic acid diluted with one ounce of water. Stir well with a glass rod for a minute or so without making a froth. Allow the solution to stand for an hour or more, then strain through a couple of thicknesses of cambric muslin. Finally add half a drachm of liquid ammonia; bottle, and cork tightly. The solution will keep indefinitely, and can be used at any time. In mixing or dissolving the colors, use one part of the albumen solution in four parts of pure water. The colors will adhere perfectly to the surface when laid on with a brush. Add to the 4 ounces of water a few drops of prepared ox gall when the colors are diluted.

(27) C. H. McC. asks: What will remove the spots from a zinc lined bath tub in which water has been permitted to stand for several days? Ordinary scouring, etc., have no effect upon it. A. Soap and sand or sapolio should be all that is necessary to remove any spots. If the spots fail to yield to these substances, a little dilute hydrochloric acid can be used, but this dissolves away the zinc.

(28) O., Ky.—The tin bath used in tin plating becomes foul by absorption of iron or other metal being tinned. The fluid tin may be poured off just above the melting point of tin by allowing the bath to cool down slowly until signs of setting are noticed, when the pure tin will run off. The refining of the spongy mass or thick tin is too difficult for ordinary practice, and this is generally sold to chemical manufacturers or to brass foundries for brass alloys. Banca tin is supposed to be the purest and best for tinning purposes. The production is very small, and the probability is that it is mostly absorbed in the English tin plate interest. The trade is not reliable, and you may buy almost any kind from the same pile.

(29) H. F. S. asks how red flannel underclothing can be treated so as not to cause constan irritation to the skin. A. The irritation is caused by the flannel and not by the dye. The belief is very common that red flannel has some special value because of its color, but the belief is without foundation, and any other color where the flannel is of the same quality is equally efficacious. The red flannel selected is often and perhaps generally thick and heavy in texture, and consequently causes an irritation of the skin, for which the dyestuff is by no means responsible. A softer flannel, or one made soft by wearing and washing, is what you need.

(30) W. T. S. asks: What will congeal gasoline so as to make it somewhat like jelly? There is a man here selling a preparation for taking grease out of clothing. He has something that he puts in gasoline which makes it like jelly. A. Gasoline, which is one of the first distillates from crude petroleum, and very much the same as benzine, will remove grease without any admixture. Possibly the ingredient is some inert substance, like fuller's earth, chalk, magnesia, or it may be Castile soap. Sometimes scouring balls are sold having the following composition: Dry fuller's earth, moistened with the juice of lemons; add a small quantity of pearl ashes and a little soft soap; knead the whole well together into a thick elastic paste; form it into small balls, and dry them in the sun. When used, moisten the spot on the clothes with water; then rub it with the ball, and let the spot dry in the sun. When washed with pure water, the spot will disappear.

(31) O. F. asks: 1. What is the best kind of putty to fill the seams of the planking on the bottom of a small sailing yacht, and how should it be mixed, etc.? A. Fuse together equal parts of pitch and gutta percha, and to this add about 2 parts of linseed oil, containing 5 parts of litharge. Continue the heat until the ingredients are uniformly commingled. This cement should be applied warm. 2. The mahogany trimmings on the above yacht are finished with an article known as Crockett's spar varnish, and cannot be removed by the use of sandpaper, emery, or scraping, except by a great amount of labor. Please inform me if there is any other means by which it can be removed with less difficulty. A. Try the preparation recommended in answer to query 17, in SCIENTIFIC AMERICAN for October 3, 1885.

(32) J. C. asks (1) the best welding compound for welding cast steel when the coal is bad. A. A good welding compound may be made by pulverizing 10 parts borax and 1 part salammoniac together; then heat the mixture until the water boils off and the mass is dry, and pulverize and use for welding in the same way as with borax powder. A better way (if you can not get coke) is to make your own coke, for welding use only, by taking from the forge fire, a little at a time, the coked or half burnt coal and quenching it by sprinkling with a little water; lay this aside for special use. 2. The reason for four rollers on roller skates? A. The wear on four rollers is much less than on two rollers. The facility for making the mechanical movement required for turning curves is also favored by the use of four rollers. Two rollers have been used. Experts now skate on one roller.

(33) A. M. writes: In trying to take out a few rust marks in a silk handkerchief with javelle water, I stained the part whereon I poured it. Will you please let me know how to remove it? A. The javelle water is a bleaching agent, and removes color. If the handkerchief was originally colored, it is doubtful whether the shade can be reproduced. When color on a fabric has been accidentally or otherwise destroyed by acid, ammonia is applied to neutralize the same, after which an application of chloroform will, in some cases, restore the original color.

(34) J. N. asks (1) how tincture of iron and steel is made. A. Tincture of iron is officinal, and therefore can be found in any pharmacopœia. It consists of solution of chloride of iron 35 parts and alcohol 65 parts. The use of the word steel becomes superfluous, as tincture of steel and tincture of iron are synonymous. 2. How carbolic salve is made. A. Take carbolic acid, ½ fluid drachm, and lard 1 ounce. Triturate together in a porcelain mortar. 3. To give name of any papers treating of the hair, in keeping it from falling out and preserving the same. A. See "The Hygiene of the Hair," SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 102 and 388.

(35) W. A. W. desires a recipe for making a mucilage such as is usually sold in stationery stores. A. The best mucilage is made by dissolving gum arabic in water, and adding a little oil of cloves to prevent its decomposition. A common receipt is: Mix 3 ounces gum arabic, 3 ounces distilled vinegar, 1 ounce white sugar; 1 part of acetic acid in 5 parts of water can be used instead of the distilled vinegar. The poorer grades are made by treating starch with sulphuric acid. The government uses the following: Gum dextrine 2 parts, acetic acid 1 part, water 5 parts. Dissolve in a water bath and add alcohol 1 part.

(36) A. E. S. asks (1) if there is anything that would keep the scum out of an aquarium without injury to the fish? A. Get a dozen or so of fresh water snails, and they will keep the aquarium in order. 2. How to clean the shells and corals of the greenish matter? A. The shells can be cleaned by washing with a little dilute hydrochloric acid. Great care must be taken to remove all traces of the acid before the shells are replaced in the water, as the acid will destroy the fish.

(37) G. W. W. asks for a description of an imitation of etched or embossed glass. A. The following is used to render glass opaque:

Mastic	50 grains.
Gum sandarac	½ ounce.
Ether	5½ "

Powder the gums and add to the ether, and shake till dissolved; then filter or pour off from the sediment after standing a while, and add of benzole from 2 to 2¾ ounces, beginning with the smaller quantity and testing till a surface of the right degree of fineness is produced, upon evaporation. This varnish should be carefully preserved in a tightly stopped bottle, so as to prevent evaporation.

(38) J. D. W. desires a formula how to make the so-called "tablet glue." A. 1. White glue, refined glycerine, acetic acid, and coloring material. 2. Common glue with about 5 per cent glycerine. 3. A quarter of an ounce crude gutta percha dissolved in carbon disulphide to the consistence of mucilage. The materials used in making this glue or cement for pads are generally of a low grade commercially, so that some experiment is necessary to make a good article.

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(39) A. F. C. asks (1) for a preparation to clean silver—liquid or paste. A. Mix 8 ounces prepared chalk, 2 ounces turpentine, 1 ounce alcohol, 4 drachms spirits of camphor, and 2 drachms liquor of ammonia. Apply this mixture to the article with a sponge, and allow to dry before polishing. 2. How to make a dressing for ladies' boots? A. See answer to query 27, SCIENTIFIC AMERICAN, vol. li., No. 17.

(40) M. S. P. writes: 1. I have two fingers dislocated in the knuckle joints. The joints are considerably enlarged, and somewhat stiff and tender to pressure. What shall I use on them to reduce them to their natural size and usefulness? A. Consult a physician is the best thing to do. Tincture of iodine or solution of arnica, or indeed both, may be applied with advantage. 2. How shall I make a cheap and serviceable paint for tar paper roof? A. See "Receipt for Roofing Paint," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 113.

(41) J. T. L. asks how to obtain a cement which can be used on crockery, etc., and not be affected by hot water. A. Calcine oyster shells, pound and sift them through a sieve, and grind them on a flat smooth stone with a muller till reduced to the finest powder, then take white of egg, and form the whole into a paste, join the pieces of glass or china, and press together 6 or 7 minutes. This cement will never yield if properly applied. Glue with which a little potassium bichromate is mixed becomes insoluble when exposed to the light.

(42) J. G. asks: 1. What is acid phosphate of lime? A. The calcium phosphate which contains hydrogen. 2. Which is the best kind of molasses to use in the manufacture of shoe blacking? A. Ordinary common molasses. 3. A receipt for a first class blacking would be very acceptable. A. See four formulas in SCIENTIFIC AMERICAN, vol. li., No. 5, in answer to query 71, and numerous subsequent answers.

(43) L. W. asks the meaning of the photographic terms f 8, f 11·3, etc. A. The term f represents the equivalent focus of a lens, which we will say is seven inches. This is multiplied by 16 or 64, which transforms the seven inches into so many sixteenths or sixty-fourths inches, say $\frac{448}{64}$. The diameter of the largest diaphragm measures perhaps $\frac{8}{64}$ of an inch; the question then arises, What part of the total equivalent focus does that represent? We find it by dividing the $\frac{448}{64}$ by 54, the diameter of the diaphragm:

54)448(8·3
432
160
162

Therefore the largest stop is equal to one eight and three-tenths of the equivalent focus, and we express it in terms f 8·3. These terms are uniform for any lens, hence it is much more intelligent to mark the stops in such terms than to call them 1, 2, 3, 4, 5, etc., as is common. f 8·3 in any lens means relatively the same sized stop; we thereby can understand readily whether it is a large sized or small stop, and what sort of an illumination we should have on the ground glass.

(44) J. H. W. asks what process of finishing Turkey red cloths undergo after leaving the dye vats, that is, from the time the cloth leaves the vats to the time when it is placed in the market for sale. A. The material is first singed over a flame or heated surface, then boiled in a soap solution, and this washed away with cold water. Next it is hot pressed under a hydraulic press at a high pressure with hot steam. In some cases it is stretched in a stretching machine. Details of the process may be found in either Professor Crookes' Practical Hand-Book of Dyeing and Calico Printing or Calvert's book on the same subject.

(45) R. W. writes: A drum or pipe is filled with water, and the cap screwed on tight. This is put inside another and larger drum, which is also fastened steam tight. Steam is then admitted to the larger drum. Now, what will be the effect on the smaller drum? Will it burst or will it collapse? A. The effect will be to generate pressure in the inner drum, equal to the pressure of the steam admitted around it. There can be no collapsing of the interior drum, and the pressure within it and outside of it being equal, the water within the inner cylinder will be in much the same condition as that in an ordinary boiler generating steam, but without ebullition or foaming.

(46) W. C. F. asks: 1. What sized cell of the battery illustrated on first page of SUPPLEMENT, No. 149, would be most economical for use in ringing electric bells? A. One quart cells will answer the purpose. 2. How many cells at each end would be required to ring an ordinary bell a distance of 600 feet over a No. 16 galvanized wire with good ground connection? A. Two at each end of the line will be required for so small a line wire; better use No. 12 for your line, when one cell will probably answer. 3. In giving surface required for plate for ground connection of lines, do you compute surface on both sides of the plate, or only one? A. Both sides of the plate are available.

(47) B. & D. write: Please inform us through the columns of your paper what the difference is between (if any) one square yard and one yard square, considering it as applied to flat or surface measure. A. The term square yard signifies a surface equal to a rectangular surface measuring one yard along each of its sides. A square yard of surface may be of any shape. The term yard square applies to anything of rectangular form that measures one yard upon each of its sides.

(48) W. B. P. asks: 1. Can a good working photographic camera be made from a lens taken from a Marcy sciopticon? It has no place for diaphragms. Are they necessary? If so, can they be added? Where can I get specific directions? A. If your sciopticon has a first class objective, it may be used in photography. You can apply diaphragms by securing a flat ring in the middle of the tube, and sawing into the side of the tube at the edge of the ring, so that you may insert diaphragms by the side of the ring. Diaphragms are often necessary to good definition and depth of field. 2. Can glue or gelatine to which bichromate of potash has been added be kept in a common glass bottle for use, or must it be kept in the dark, or be prepared fresh each time? A. Glue to which bichromate of potash has been added must be kept in the dark or be freshly prepared. 3. After it has dried and become insoluble in water, does it become hard and brittle? A. Yes. 4. Is frequent oiling good for a new harness? A. Yes, if oiled with neatsfoot oil. 5. Ought it to be oiled each time it is cleaned? A. Yes. 6. Can you recommend a preservative dressing that will leave the leather bright and smooth, so that dust will not adhere and water will not penetrate? A. Consult SUPPLEMENT, No. 368.

(49) B. A. L. asks: 1. A practical receipt for a lacquer for varnishing an old theodolite? A. Good lacquer can be made by dissolving seed lac in 95 per cent alcohol, afterward filtering the varnish thus produced, and coloring it with turmeric or dragon's blood. If you are unable to procure seed lac, use the best quality of white shellac instead. The article to be lacquered should be slightly warmed before applying the lacquer, to prevent it from becoming chilled. The lacquering should be done in a very warm room, and as soon as possible after the application of the lacquer the article lacquered should be warmed, either by placing it in an oven or by applying to it the heat of a Bunsen gas burner or alcohol lamp. 2. Which is the working side of the inclosed piece of drawing paper? A. The rough side. 3. Is the concave side of rolled paper always the working side? In some papers there are no water letters. A. It should be, because the working side is in that way kept clean.

(50) Querist asks: I have seen several articles published in regard to oil on the troubled waters, but no satisfactory solution of the phenomenon. The idea has occurred to my mind that electricity may have something to do with it. It is a well known fact that oil is almost a non-conductor of electricity; that being the case, are there different kinds or qualities of electricity in combination with the atmosphere and the water? If so, have they any attraction for each other, and would an insulator destroy the attraction? Does the wind passing over the water create friction enough to excite or produce electricity similar to friction of metals? Or would the wind passing over oil (that being a non-conductor) confine the different kinds of electricity to their own elements, or the air kind to the air, and the water kind to the water? A. We think the electricity generated by the passage of the wind over the surface of the water is immediately conducted away by the water. It is probable that electricity has nothing whatever to do with the quieting effect of the oil upon the water.

(51) C. W. T. asks: 1. Are steel screws stronger than brass? A. Yes. 2. Is there any way simpler than plating them, to prevent rust? A. Bluing them will prevent rusting to a great extent; nickel or brass plating is probably better. 3. Would not bricks set in Portland cement make good ballast for flat bottomed sailboat? A. They would answer very well, although heavier material would be better. 4. Would not screws serve as well as nails in putting a flat bottomed boat together? A. Yes.

(52) E. W. R. asks (1) how celluloid stereotypes are made. A. Celluloid stereotypes are made by placing the dried mould and the celluloid of which the stereotype is to be made in a frame provided with a spring, which will keep the celluloid under constant pressure. The whole is then immersed in hot oil, until the celluloid is sufficiently softened to be forced into the mould by the spring. 2. What to put on, to prepare plaster of Paris moulds for casting? I have no trouble to make the moulds, but cannot fill them with metal so as to make a perfect cast. A. Plaster of Paris moulds for metal stereotypes must be very thoroughly dried before any attempt is made to use them. The common method of drying them is to bake them in an oven until no further moisture can be removed in that way. They are then immersed in the melted metal, face upward, and allowed to remain until bubbles cease to rise from the mould. It is then lifted from the melted metal, bringing with it a portion of the metal, and supported in a horizontal position until the metal is cooled.

(53) F. W. T. asks: 1. Would Swedish iron do as well as soft cast iron for armature? A. It would answer very well, but would be no better. 2. How can I stop the articles turning black when plating nickel? Consult SUPPLEMENT, No. 310. 3. Would I have a right to sell the machine I am making? A. We cannot reply to this query without knowing what kind of machine you are making. 4. What kind of a gas is made by putting zinc in nitric acid? A. Hydrogen gas.

(54) O. A. writes: I possess a camera front Dallmeyer lens, 10x12, rapid rectilinear, lenses 2 inches diameter. Could I use it in a camera 5x8 for dry plates by substituting the same for the original, and what would the result be? A. If you use a 10x12 rapid rectilinear Dallmeyer lens on a 5x8 camera, the picture will be too large in proportion to the plate. This may be remedied by placing the camera at a much further distance from the object to be photographed than would be necessary ordinarily, and thereby have the picture of a proportionate size.

(55) C. J. F. writes: I have bent seven pieces of tire steel 1 inch by ¼ inch into a uniform horseshoe shape, and bound them together. They weigh about 20 pounds. What quantity of wire and what gauge will I require to work it as an electro-magnet. Also, how many Bunsen cells will it require, and the probable strength of attraction? A. Steel is not suitable for the cores of electro-magnets. You should use the softest iron, with a winding of No. 16 wire, and with iron cores of the size given you would require about four Bunsen cells. Such a magnet ought to sustain from 200 to 300 pounds.

(56) J. M. A. writes: I would like to know if it is absolutely necessary in using Mangin's optical telegraph (SUPPLEMENT, No. 284, page 4522) that nothing should intervene between the observers. Can the instrument be made to reflect a beam of light upward so as to be visible 25 miles, the country level but heavily timbered? How can I obtain data for formulating the lenses? A. Telegraph signals have been produced by illuminating clouds with light flashes, but this plan is impracticable. The only practicable way of telegraphing by light flashes is to throw the light directly from one station to the other. There can be no intervening object. Consult SUPPLEMENT, Nos. 253, 258, 287.

(57) T. McN. asks: Will you please tell why rotary engines have never come into practical use? What the objections to them, etc.? Can you furnish me any work treating of them? A. Because they are practically far inferior to the reciprocating engine, and because they are theoretically no better; also because of the difficulty of constructing a rotary engine with suitably packed contact surfaces. Rotary engines, so far as we know, have proved to be very uneconomical. You will find most of the types of rotary engines described in Reauleaux, Kinematics of Machinery.

(58) J. D. writes: 1. I should like to know how large can a dynamo machine be made like the one described in SUPPLEMENT, No. 161? Is there any danger of the wire on the armature swinging out and touching the electro-magnet? If made on a much larger scale, does the thickness of wire want to be increased accordingly? A. A few years ago these machines were made of quite large sizes, and many of them are now in use for the electric deposition of metals, but they have been superseded by more efficient and economical machines. In large machines the armature is grooved circumferentially at different points along its length, to receive a binding wire which is wound around the iron and the wire forming the conductor of the armature to restrain it, and prevent it from being thrown out by centrifugal action. 2. What is a good thing to mix with rouge to keep in a paste, such as is sold in the stores in tin boxes for polishing purposes? A. A mixture of beeswax and olive oil. 3. What is oxide of tin soluble in? A. Protoxide of tin is soluble in acids. Binoxide of tin when fused with alkalies or their carbonates forms compounds which are soluble in water. 4. Is there any rule laid down in which the different numbers of wire can be known in parts of an inch? A. Nearly all electrical works contain tables in which the various sizes of wire are given in fractions of an inch. 5. What is a good hard paste for a razor strap? A. See answer to No. 2. 6. What is the wire made of that is used in the Edison electric lamp? A. The wire conductors which extend through the glass are platinum. The loop which gives the light is a filament of carbon.

(59) F. E. P. asks: 1. How many times will the hammer of a common clock strike from noon till 6 o'clock in the evening? A. Twenty-seven times. The striking mechanism of a clock is released exactly at the close of the hour, so that the striking for any hour of the day really transpires after that hour has passed. For this reason all of the hours which would be struck between noon and six o'clock would be 12, 1, 2, 3, 4, 5, the sum of which is 27.

(60) T. P. E. asks the origin of the length of the yard measure. Also why St. Rupert's drop was so called? A. The yard appears to have had its origin in England in the reign of Henry the First, "who ordered that the ancient ell should be made of the exact length of his own arm, and that the other measures of length should be based upon it.", In 1824 it was enacted by the English Parliament that if the standard yard should be lost or defaced, it should be restored by making a new standard yard bearing the same proportion to a pendulum vibrating seconds in London as 36 inches bears to 39·1393 inches, the latter being the length of a pendulum vibrating seconds in London. This measurement, however, was found incorrect when the attempt was made to reproduce the standard yard, after the destruction of the Parliament House by fire in 1834. The standard was restored by making four standard yards from the best authenticated copies of the old standard. These duplicates are the bases of the present United States and English standards of length.—Prince Rupert's drops were so called from Prince Rupert, who carried them to England and showed them to Charles II., in 1661.

(61) M. A. W. sends a plant for identification. A. It is the *Monotropa uniflora*, known by the common names of Indian pipe, corpse plant, ice plant, fit plant, etc.

(62) J. W. M. writes: 1. When grinding with an emery wheel, is it the iron or the emery that gets in the eyes and is so hurtful? A. Both emery and iron are thrown off in the operation of grinding with emery wheels. If the particles become embedded in the eye, so that they cannot be removed with a pointed stick, the end of which has been slightly bruised and wet between the teeth, you should apply to a competent surgeon. It is always best while using an emery wheel to employ some protection for the eyes. 2. What is the best way to get it out? Also give me a receipt for making a good soap to take off grease from the hands, such as oil, from a dirty machine shop. A. Try alcohol and aqua ammonia equal parts.

(63) J. F. W. writes: I am about to commence the study of insectology, and have been told to get a microscope; what powers will be required? A. You will require a microscope of medium quality, with about three objectives and two eyepieces. The entire insect should be examined first with a low power, say a two inch; then the general structure may be examined by a higher power, say a 3-4; finally, the details will require a 1-4 or 1-5. 2. Which is the more interesting study—insects or botany? A. It depends entirely upon the taste of the student; both subjects are deeply interesting, and might be conveniently carried on together. 3. I had a collection of moths, butterflies, and insects; some kind of an insect got into my boxes and destroyed them. Is it not the cabinet beetle? A. Probably. The buffalo moth is also destructive of specimens of this kind. 4. Is there any preparation with which I can capture nocturnal insects? A. By employing a light and a net you will be able to secure the insects. Ordinary sticky flypaper might be of some service in this connection. 5. In capturing insects last summer, I killed them by dropping them in a bottle in which I had previously burnt a piece of sulphur. Is there any better way? Prussic acid. I have been told. A. Place your insects in a long necked bottle, and a short distance down the neck insert a pledget of cotton. Place a few drops of ether or chloroform on the cotton, and close the mouth of the bottle with a cork.

(64) L. M. F.—The lower layer of bricks undoubtedly supports the entire building.

(65) M. R., Jr., writes: What is the latest discovery in metallizing a non-metallic substance, like wood or plaster of Paris, for instance? I wish to electroplate wood and plaster of Paris figures, and do not want to take moulds of them in wax. I know that by first coating the substance with wax or paraffine plumbago will adhere to it, but I wish to learn of a speedier way of preparing them for the bath. A. We know of no speedier way of preparing articles for the electro deposit of copper than the one you describe. There are different ways, however, among which are the deposition of a film of silver, also the covering of the objects with the bronze powder.

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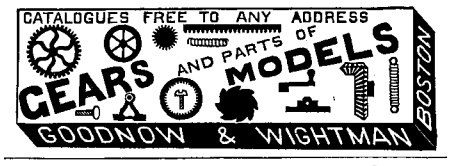

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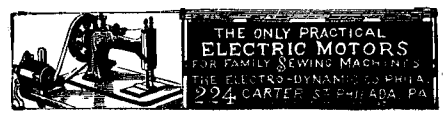

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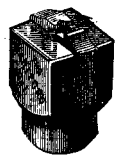

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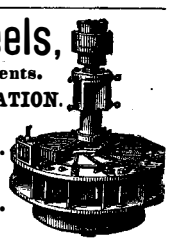

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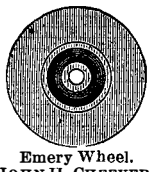

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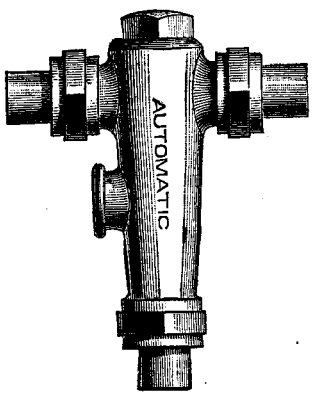

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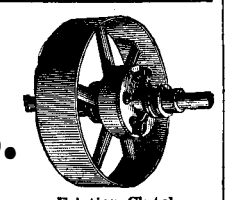

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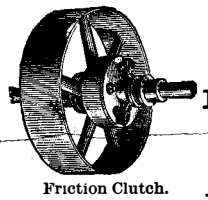

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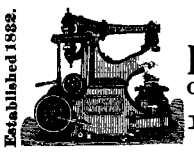

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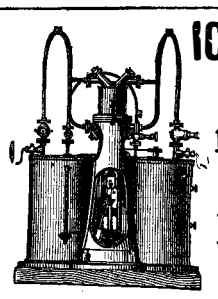

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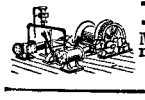

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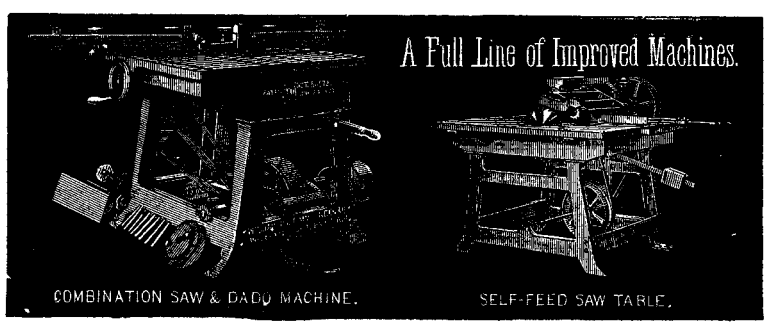

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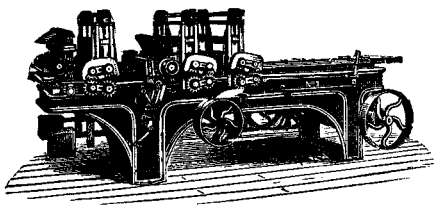

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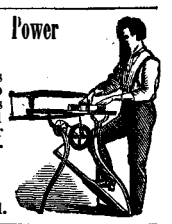

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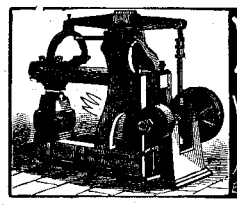

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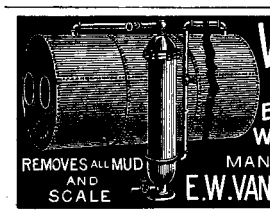

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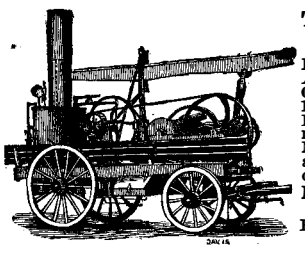

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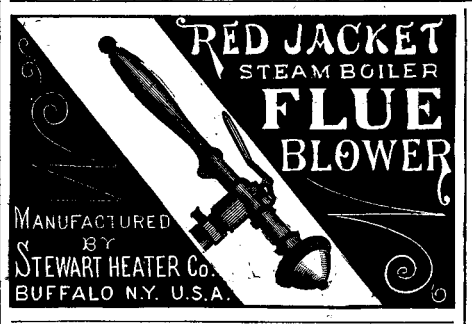

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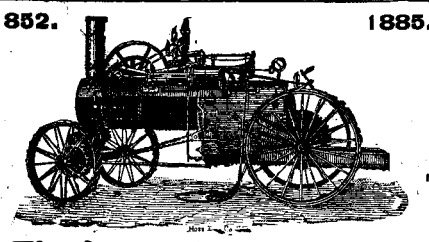

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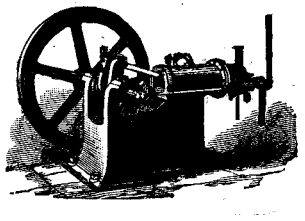

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